

JOURNEY TO PLANET EARTH

Educators Guide

College & University

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"JOURNEY TO PLANET EARTH" CORRELATES TO THE FOLLOWING
NATIONAL SCIENCE EDUCATION STANDARDS:

Content Standard A— Abilities Necessary to Do Scientific Inquiry

Content Standard C— Life Science

Structure and Function in Living Systems

Reproduction and Heredity

Regulation and Behavior

Populations and Ecosystems

Diversity and Adaptations of Organisms

Content Standard D— Earth and Space Science

Structure of the Earth System

Earth's History

Content Standard E— Science and Technology

Abilities of Technological Design

Understandings about Science and Technology

Content Standard F— Science in Personal and Social Perspectives

Personal Health

Populations, Resources and Environments

Natural Hazards

Risks and Benefits

Science and Technology in Society

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Episode #1 -- "RIVERS OF DESTINY"

Overview

"Rivers of Destiny" focuses on four rivers -- the Mississippi, the Amazon, the Jordan and the Mekong. Each locale serves as an example of what can happen when human beings tamper with the natural system of a river. Without thoughtful planning, the consequences can be disastrous. But if communities work together, a balance can be achieved between the needs of people and the needs of the river.

In 1993, major flooding nearly destroyed the Mississippi River community of Grafton, Illinois. The film examines why and explores how the people who live along the Mississippi can prevent similar disasters in the future.

Over fishing and deforestation are having dramatic impacts on the Amazon River. Can a balance be found that preserves this river basin, which is so critical to Brazil's inhabitants?

The River Jordan sustains a narrow ribbon of life through a dry and barren desert. Access to its waters is essential for survival but the river is heavily guarded.

Southeast Asia's Mekong River is at the heart of economic growth in the region. How can the nations that depend on the Mekong for their new-found prosperity exploit the river without doing permanent damage?

The flow of sediment into the Mississippi Delta has been altered by upstream development and flood control. As a result, large areas of wetland are disappearing and the shrimping industry is in decline.

Pre-screening Activities

Introduce the following key terms to students:

- **Aquatic feeding ground** – an area from which water-life obtains food.
- **Deforestation** – the chopping down of trees from a specific area.
- **Delta** – a fan-shaped outgrowth of sediment at the mouth of a river.
- **Fertile soil** – soil that is rich in nutrients.
- **Flood plain** – a strip of relatively flat land bordering a stream, river or lake that conveys the overflow of floodwaters.
- **Levee** – an embankment built alongside a river to prevent high water from flooding surrounding land.
- **Rain forest** – a woodland with an annual rainfall of at least 100 inches and marked by broad-leaved evergreen trees forming a continuous canopy.
- **Runoff** – that part of precipitation that cannot immediately be absorbed into the surrounding earth.

The video is divided into five segments, each approximately 11 minutes long. They can be viewed individually, followed by separate discussion sessions, or the video can be viewed in its entirety.

You may want to suggest that as the students watch video segments, they look for the results of human tampering with rivers and for some of the solutions or compromises people have come up with in order to live in harmony with our waterways.

Post-screening Activities

The topics in these activities could be covered in one lesson or extended into several lessons. The following viewing activities offer opportunities for student discussion of how their lives are inescapably tied to rivers, and how unexpected changes can impact the environment and threaten their way of life.

Mississippi River

1. If the actual amount of rainfall along the Mississippi River hasn't really changed over the past 90 years, what caused the flooding in Grafton? (Answer: Deforestation and the addition of concrete and asphalt to the wetlands accelerated runoff and flooding.)
2. Why do communities along the Mississippi River need to re-evaluate plans for further development? (Discuss why rivers flood naturally and this can't be prevented.)
3. What is meant by this phrase from the video "...nothing can stop a powerful river from trying to reclaim its rightful inheritance." (This is an opportunity for student discussion.)

Amazon River

1. What causes the Amazon River to invade the flood plain each year? (Answer: dense tropical rains during the rainy season.)
2. What are some of the consequences of this flooding? (Answers: An underwater forest is created which serves as an aquatic feeding ground to over 3,000 species of fish. The flooding also renews the fertile soil of the flood plain.)
3. What effect do you think the destruction of the rain forest will have on you? And, why would it be in your best interests to protect the rain forest? (Answers: Plants used for producing medicines would be lost along with animal species. Destruction of the rain forest could affect global warming/the Greenhouse Effect and influence air quality.)
4. How do satellite radar images help us to monitor the devastating changes to the rain forest? (Answer: Remote Sensing images show where trees have been cleared.)
5. Is there a solution to this problem? What can we do? (student discussion)

Jordan River

1. Why is water so critically important in the Middle East? What impact does the River Jordan have on the desert? (Answer: There is very little rain; the river enables people to grow food.)

2. How did the Nabateans collect water in the desert? (Answer: They channeled it into cisterns along a surface crust, which formed on the soil.)
3. Is fresh water a finite or an infinite resource? (Answer: Finite but recyclable)

Mekong River

1. What water uses in the upper part of the Mekong have affected the Delta? (Answers: Reservoirs for electric production, reservoirs for irrigation.)
2. Why have the monsoon floods in the delta become more severe? (Answer: Because of upstream deforestation along the floodplains.)
3. Why is it necessary to pump fresh water into the lower delta? (Answers: Upstream demands have reduced the river's flow, allowing salt water from the South China Sea to invade the land.)

Mississippi Delta

1. Is a river's course fixed forever or can it change? How did this threaten New Orleans? (Answer: It can change. The Mississippi threatened to change course away from New Orleans, leaving the port dry.)
2. Why are the wetlands of a delta so fertile? (Answer: because a river deposits nutrient-rich sediment across the delta.)
3. What is happening to the farmland and fresh-water wetlands in the delta? (Answer: They are being washed away and inundated with salt water.)

Episode #2 -- “THE URBAN EXPLOSION”

Overview

Every day of the year, tens of thousands of people move to the world’s burgeoning cities in search of a better life. Instead they find sprawling slums, massive traffic jams, chronic unemployment, regular failure of electrical and water services, strained educational and recreational facilities and skyrocketing fuel and food costs. The uncontrolled development of the world’s major cities has led to a series of problems: air pollution, water pollution, waste disposal, housing shortages and loss of farmland.

As the 21st century dawns, the question is how to balance economic growth with the health of the world's large metropolitan cities? How do these cities shelter and sustain their residents without destroying the delicate balance of the environment? The four mega-cities (cities with populations of over ten million people) profiled in “The Urban Explosion” are Mexico City, Shanghai, Istanbul and New York City. Through the activities found at the end of this lesson, students will learn more about the problems facing the world’s mega-cities, possible solutions to those problems and the need for urban planning.

Pre-screening Activities

Introduce the following key terms to the students:

- **Ecosystem** – the community of plants and animals interacting with one another and the environment.
- **Infrastructure** – the foundation on which economic development is based, including the transportation, communication, electrical and water supply systems of a community, city, or nation.
- **Mega-city** – a city with a population in excess of ten million people.
- **Pollution** – the contamination of soil, water or the air by the discharge of harmful substances.
- **Sustainability** – the ability to maintain or keep from collapsing.
- **Toxic** – poisonous, capable of causing injury or death, especially by chemical means.
- **Urbanization** – growth in the portion of a population living in areas of more than 2,500 people.
- **Urban sprawl** – the unplanned, uncontrolled spreading of urban development into areas adjoining the edge of a city.

The video is divided into four segments, each approximately 14 minutes long. They can be viewed individually, followed by separate discussion sessions, or the video can be viewed in its entirety.

You may want to suggest that as the students watch video segments, they look for some of the problems resulting from uncontrolled urban growth and possible solutions. These problems demonstrate the need for a plan or vision to manage urban development."

Post-screening Discussion

Mexico City

1. What are some of the environmental problems Mexico City is facing today? (Answer: air pollution, water pollution, sinking land.)
2. What geographic features contribute to Mexico City's environmental problems? What is meant by a closed ecosystem? (Answer: little wind to cleanse the air and no ocean or major rivers to exchange water and sewage.)
3. What causes the problem of smog in Mexico City? (Answers: the combination of three million cars, 35,000 factories and its geography.)
4. How do you think Mexico City might solve these problems? (Answers will vary -- stricter emission standards, public transportation, etc.)
5. Do we face any of these same problems where we live? What are we doing or what can be done to help? (Answers will vary.)

Istanbul

- What is causing Istanbul's water shortage problem? (Answer: a rapid increase in population due to migration to the city.)
- What is causing Istanbul's water pollution problem? (Answer: a lack of sufficient waste water treatment facilities and excessive shipping traffic on the waterway going right through the middle of the city -- the Bosphorus Strait.)
- How has the water pollution problem affected the fishing industry? (Answer: The catch is meager.)
- Do you know of any water pollution problems in your area? What do you think should be done about them? (Answers will vary.)

Shanghai

1. What was the cause of the smog in Shanghai? (Answers: burning low-grade coal to warm homes and run factories; car emissions.)
2. How are they trying to solve this problem? (Answers: limitations on ownership of cars and stricter air quality regulations for factories.)
3. What are they doing about the traffic problem? (Answer: rebuilding the city's infrastructure, starting with a rapid transport system such as the subway system found in cities like New York.)
4. Would these same methods work in Mexico City? Why or why not? (Answers will vary.)
5. How about in your area?
6. How is the city of Shanghai dealing with its water pollution problems? (Answers: A series of huge tunnels are being built to collect wastewater that will then be treated and flushed out to sea. A new water purification plant has been built for drinking water.)
7. Do you know where your local wastewater treatment facility is located and how it operates? (Answers will vary) Note: This may be a good field trip opportunity.

New York

1. 17. How are the environmental issues for the people of New York City similar to those in Mexico City, Istanbul and Shanghai? (Answer: The quality of their lives is controlled by their city's ability to cope with rapid change.)
2. What sets New York City apart from Mexico and Istanbul in terms of how they deal with their environmental problems? (Answer: New York City has a vision, a plan for a unified system.)
3. What is the importance of having a plan before starting any expansion or development? (student discussion)

Episode #3 -- “LAND OF PLENTY, LAND OF WANT”

Overview

As the population of Planet Earth continues to grow, it is necessary to understand the delicate balance that is needed to preserve the environment while feeding the world's inhabitants. Students will see in the upcoming video segments the need to find ways to reconcile economic growth with the continued health of the land. As cities have expanded, farmland has been lost to development. In an effort to feed the ever-increasing population of the planet, farmers have experimented with various methods of increasing agricultural yields. Some of these methods, over time, have proven to be unhealthy for the environment. Now, more than ever before, it is critical that farmers and scientists work together to develop a sustainable agricultural system through the effective management of Earth's natural resources. Sustainable agriculture is the use of farming practices that will produce food for consumption without causing harm to the environment.

“Land of Plenty, Land of Want” gives students the opportunity to view farming in four distinctly different countries: Zimbabwe, France, China and the United States. Through viewing farming methods throughout the world and the different challenges facing the world's farmers, the students will be able to appreciate the commonality of all farmers. They all live on a thin edge; vulnerable to the natural forces of weather, climate and changing soil conditions, as well as the people-imposed forces of pollution, population shifts and political intervention.

Pre-screening Activities

Introduce the following key terms to the students:

- **Arable land** – land fit to be cultivated or farmed.
- **Contour farming** – farming on sloping land in such a way that the land is prepared, planted, and cultivated in rows that are "on the level" and follow the contour of the slope, thus reducing soil erosion.
- **El Nino** – a warming of the surface ocean waters off the western coast of South America, occurring every four to twelve years, and affecting weather worldwide.
- **Erosion** – process whereby materials of the earth's crust are loosened, dissolved, or worn away and moved, usually by water or wind.
- **No-till farming** – Planting crops without plowing the land; the farmer plants a cover crop that is rolled onto the land first to protect the soil from the elements. The harvest crop is then sown in the cover crop.
- **Pesticides** – chemicals used to kill pests, especially insects.
- **Pollution runoff** – an overflow of fluid not absorbed by the soil, which contains waste products and other contaminants.
- **Population shift** – the migration or movement of people from one country or region in order to settle in another.
- **Sustainability** – the ability to remain in existence without exhausting resources.
- **Topsoil** – the upper few inches of the soil in which worms, beneficial bacteria and humus can be found.
- **Toxic waste** – poisonous by-products resulting from industrial processes, as well as organic waste from animal farms.

The video is divided into four segments, each approximately 14 minutes long. They can be viewed individually, followed by separate discussion sessions, or the video can be viewed in its entirety.

You may want to suggest that as the students watch video segments, they look for examples of drought and erosion, misuse of pesticides, pollution and loss of farmland to urbanization. The video will illustrate examples of these problems as they affect sustainable agriculture and will offer possible solutions.

Post-screening Activities

The following viewing activities offer opportunities for student discussion of the problems and possible solutions of sustainable agriculture. The topics in these activities could be covered in one lesson or extended into several lessons. There are a variety of topics that may spark student interests throughout the video segments. Feel free to offer expanded explanations and to encourage students to research and explore specific areas according to their interests.

Zimbabwe

1. What elements in nature make farming in Zimbabwe more difficult? (Examples include environmental disasters, weather conditions, and climate. Students may also want to discuss the effects of El Nino.)
2. How do you think drought might affect the price of agricultural products in our area? (Students may want to use the Internet to research answers. Have them search under "drought.")
3. How did David Jura take the battle for agricultural sustainability into his own hands? (Answer: David built a dam.)
4. What effects do you think his solution may have had on people living downstream? (student discussion)
5. If you have a stream on your own property, can you build a dam to create a reservoir? Why or why not?

France

1. Like France, other areas of the world also face pollution runoff, not just from chemicals, but also from toxic waste produced by animal farms. Pollution is a problem for which we seek solutions. What are some of the reasons we use chemicals in the production of agricultural products?" (Answers: increased yields and more efficient production)
2. Animal waste pollution in agricultural production is becoming a real problem, a problem for which we have not yet found a solution. What are some ways you think we can solve this problem?" (Student answers will vary.)

China

1. In China, how has booming industrial growth affected land for farming? (Answer: Growing industries are taking over land previously available for farming.)
2. Why do you think China has chosen industrial growth over agricultural production? (Answers will vary.)
3. What other countries do you think are facing this same problem? (Student discussion)

United States

1. There are a shrinking number of farmers in the United States today. At the start of this century, farmers made up nearly 35 percent of the total population. Today, fewer than two percent of American families work the land. How can this impact food production and development in your community? (student discussion)
2. What method did Joe Horan use to know exactly when and where to apply chemicals? (Answer: precision farming with satellite technology.)
3. How has technology helped to improve agricultural production? (Answer: Through the use of computers and satellites, farmers are better equipped to anticipate weather conditions and improve production.)
4. What problems have chemicals and other farm pollutants caused to our soil, air and water? (Answers will vary.)
5. What are some other benefits that resulted from Steve Groff's sustainable agricultural system? (Answers: reduced use of insecticides and fungicides; consistently increased yields.)

Episode #4 -- "ON THE BRINK"

Overview

"On the Brink" explores the connections between environmental pressures and political and social instability. Environmental degradation and poverty are often linked: poverty can lead to damaging environmental practices, especially in over-populated areas, and a damaged environment can compound poverty. The conditions of poverty (over-crowding, hunger, disease, lack of food and clean water) result in desperation, which can, in turn, lead to political instability, violence, corruption and terrorism. Video segments explore these connections by focusing on case studies in Bangladesh, South Africa, Peru, and Haiti. Finally, the issues are brought closer to home through the last segment, which focuses on poverty and the movement of migrants from Mexico and Central America across the border of the United States. Thus, students will consider the potential effects of instability in developing countries with stability in the United States.

Pre-screening Activities

Introduce the following key terms to students:

- **monsoon** – season of wind and heavy rainfall in India and adjacent countries.
- **cyclone** – a hurricane-like storm, often violent in the tropics and usually moderate elsewhere, with a diameter of 50 to 900 miles.
- **environmentally-marginal land** – land that is not productive for crops or other human activities due to natural conditions or damage by humans.
- **arid** – having insufficient rainfall to support agriculture, usually less than 10 to 15 inches annually.
- **subsistence farmers** – farmers who can only produce enough crops for their family to survive from year-to-year.
- **deforestation** – the clearing of trees from a forest.
- **soil erosion** –the wearing away of the soil by natural forces, such as water, wind and ice.
- **disenfranchised** –deprived of basic power, rights, and privileges.
- **indentured work camp** – a place of work where workers are bound to work for a given length of time, often with minimal income.
- **land reforms** – measures designed to establish a more equitable distribution of land, especially for agricultural purpose.
- **impoverishment** – a condition of being weak, poor and depleted of nutrients; can refer to people and/or to the environment.
- **Mortality Rate** – the proportion of deaths in a population.
- **Morbidity Rate** – proportion of disease in a population.

- **Apartheid** – a policy of segregation and political and economic discrimination against non-European groups in South Africa.
- **guerrilla warfare** – fighting by an irregular, usually indigenous military or paramilitary unit operating in small bands in occupied territory to harass and undermine the enemy.
- **counter-insurgency effort** – military activities designed to thwart insurgencies such as a guerilla warfare.
- **coup** – a sudden overthrow of a government or leader by a small group of people already having some military or political authority.
- **dowry** – the money, goods, and or land that a woman brings to her husband in marriage.
- **conquistador** – any of the Spanish conquerors of Peru, Mexico and other parts of America in the 1500s.
- **smuggling** – to illegally and secretly bring items or people into or out of a country.
- **Coyotes** – smugglers of illegal aliens from Mexico to the United States
- **deport** – to force someone to leave a country by official order.
- **environmental refugees** – people who flee their home or country to seek refuge elsewhere due to extreme environmental conditions such as erosion of good soil for crops, lack of drinking water or severe pollution.

Post-screening Activities

The topics in these activities could be covered in one lesson or extended into several lessons. The following viewing activities offer opportunities for student discussion of how their lives are inescapably tied to the environment and the consequences of environmental degradation and human suffering.

Poverty and Violence in Bangladesh:

1. As you watched the first scene, what general observations did you make about the city: its conditions, what people were doing, and how?
2. What is the average income in Bangladesh? (Answer: \$225/year.) Why did people from Bangladesh move to Calcutta, India? (Answer: They were trying to escape the conditions of extreme poverty in Bangladesh, and were trying to find a better way of life. However, in many respects, Calcutta had similar conditions.)
3. How does the population in Bangladesh compare to the United States? (Answer: 132 million people living in an area the size of New York State; approximately half the population of the United States.)
4. Why would a cyclone in Bangladesh kill 200,000 people, but a cyclone of the same size in the United States result in few deaths? (Answer: This is primarily due to the combination of a densely packed population that lives in substandard housing on land that is virtually at sea level.)
5. How are the people of Bangladesh plowing and harvesting? How does this compare to methods in the United States? (Answer: People were using hand tools or tools pulled by oxen rather than tractors and other mechanized equipment.)
6. Why are farmers in Bangladesh getting poorer in each generation? (Answer: There is no more cropland to distribute, so each generation has to sub-divide the land it has.)
7. Why do so many people migrate from the countryside to cities? (Answers: See the answer to number six above. Also, even though the soil is rich, there is little rainfall for ten months of the year. In addition, 40% of the water from the Ganges River gets diverted by a dam in India. Thus, life in the countryside is very difficult, so people move to cities in hopes of work and a better way of life.)
8. What does extreme squalor mean? (Answer: Living in conditions of poverty, often with no electricity, sanitation or running water.) How many in Dhaka, Bangladesh live in these conditions? (Answer: Three million, or one-third of the population of Dhaka.)
9. According to Thomas Homer-Dixon, what three factors, in combination with environmental stresses, can lead to violence? (Answer: Availability of weapons, weak governments, and deep ethnic tensions.)

Alexandra, South Africa and Apartheid:

1. How many people move from the rural countryside to the city of Alexandra each year? (Answer: Tens of thousands.)
2. Why do so many people move from rural to urban areas? (Answer: Apartheid policies concentrated industries and jobs near urban centers, so there are few job opportunities in rural areas. The people are very poor and hungry.)
3. What is the city of Alexandra trying to do to help migrants? (Answer: An \$80 million government initiative provides money for homes, schools, and health facilities.)

Lima, Peru and the Shining Path:

1. Why are the peasants in the high Andes so poor? (Answer: The terrain is very dry, so cultivation of crops is difficult. Farmers generally produce just enough food to live for a year. In years of drought, there is hunger.)
2. Why are millions of peasants moving to Lima, Peru? (Answer: They are leaving their subsistence way of life in hopes of economic opportunity.)
3. According to Thomas Homer-Dixon, what two circumstances led to the rise of the Shining Path? (Answer: Land scarcity and impoverishment.)
4. Peruvians living in poverty have few options. What three options were outlined in the video? (Answer: Continue living in poverty; start a new revolutionary movement; join the mass migration north.)

Economic and Environmental Collapse in Haiti:

1. What are the two most significant environmental pressures facing Haiti? (Answer: Loss of forests because wood is used as charcoal for cooking; severe soil erosion due to deforestation, so fertility of soil for crops is poor.)
2. What percentage of Haiti's original forest still stands? (Answer: 2%.)
3. Why has so much of the forest been cut down? (Answer: Wood is used as charcoal for cooking; Haitians don't have access to gas or electric stoves as we do. Trees are also cut down for farmland.)
4. What two environmental problems has deforestation led to? (Answer: Severe soil erosion; the silt from erosion ends up killing fish, affecting the fishing industry.)
5. Why does severe erosion make life for Haitians more difficult? (Answer: The loss of soil makes it more difficult to grow crops, which Haitians depend upon for food. Haitians who rely on the fishing industry for income are also affected.)
6. The video states that Haiti faces totally economic and environmental collapse. How are these two ideas connected? (Answer: Because people are poor and cannot afford other methods of cooking, they cut down trees for charcoal. This has led to severe soil erosion and the collapse of their fishing industry. Without the fishing industry or ability to grow crops, the people of Haiti will suffer even more severe economic circumstances.)
7. The video mentioned that financial aid to Haiti from foreign countries can be cut off. Why would foreign countries do this, when they do want to help the people of Haiti? (Answer: Sometimes government officials are corrupt and don't pass the foreign aid on to the people who most need it. It's often difficult for foreign countries to know that their contributions are going to the causes that were intended.)
8. In 1991, the United Nations intervened in Haiti. Why did they intervene? (Answer: To install a democratically-elected government in order to avoid the corruption and human rights violations that were taking place in Haiti.)
9. Why would the United States and United Nations find it in their interests to install a democratic government rather than a dictatorship in Haiti? (Possible Answer: A democratic government would probably be less corrupt, would be more supportive of human rights issues, and could more effectively help the Haitian people.)

Illegal Immigrants along the Mexico-United States Border:

1. Why are so many people trying to leave Mexico, Central, and South America? (Answer: Acute poverty and environmental degradation, which make their lives more difficult.)
2. What is the economy of Agua Prieta based on? (Answer: Smuggling of migrants.)
3. Why is Tommy Bassett helping the migrants? (Answer: He feels the migrants are simply trying to improve their own and their families' lives. He also feels our immigration policies force migrants deeper into the desert, where the conditions are extremely harsh and life-threatening.) © 2003 Screenscope, Inc. Page 4 of 4 On the Brink: College Professor's Guide
4. Of the people who attempt to cross the border, how many are successful? (Answer: 2/3.)
5. What happens to people who get caught while crossing the border? (Answer: They are put in detention centers where they are asked questions and held until they are returned to Mexico. Most of them will attempt to cross the border again. On any given day, an average of 20,000 people are held in detention centers.)

Episode #5 -- "SEAS OF GRASS"

Overview

Among the most endangered ecosystems today are the world's grasslands. Threats menacing them include overgrazing, soil erosion, urbanization, and replacement of natural vegetation with agricultural fields and tree plantations. When native grasslands disappear, so do the unique plants and animals that depend on them. Also at risk, are unique human cultures and lifestyles specially adapted to them: Mongolian nomads, Argentine Gauchos, and American cowboys all have developed distinctive ways of thriving in the challenging conditions of the world's grasslands, whether we call them prairies, pampas, veldts, or steppes. The preservation of both our cultural and our natural heritages, therefore, depend upon how successfully we can preserve the natural grasslands that support both.

Pre-screening Activities

Introduce the following key terms to students:

- **Pampas** – the vast plains of southern South America, chiefly in Argentina, but also in Uruguay, southern Brazil, and southeastern Paraguay.
- **Veldt** – the extensive grasslands of South Africa.
- **Prairie** – grasslands, especially in the interior of North America.
- **Steppe** – the plains of interior Eurasia.
- **Savannah** – a grassland with scattered trees, typical of East Africa.
- **commons** – a natural resource, such as a pasture or a population of marine fishes, which nobody owns but many people can use. Commons are often exploited because each person using the commons is motivated to use it as much as he or she can.
- **erosion** – the carrying away of soil by wind, ice, water and animals.
- **carrying (grazing) capacity** – the amount of animals that can be supported by a piece of land or body of water.
- **sedimentation** – the deposition of eroding soil onto land or into water.
- **gers** – the tents, made of canvas and felt, used by nomads in Inner Mongolia.
- **Gauchos** – the cowboy of the South American pampas.

Post-screening Discussion

The topics in these activities could be covered in one lesson or extended into several lessons. The following viewing activities offer opportunities for student discussion of how their lives are inescapably tied to the grasslands and the consequences of their environmental and cultural degradation toward human suffering.

Grasslands in Inner Mongolia:

1. What weather conditions create the grasslands in Inner Mongolia? (Answer: Hot and dry summers, long, cold winters. These typically create grasslands worldwide.)
2. Why do the people who live on the Mongolian grasslands roam around instead of living in one place? (Answer: They move in search of grass to feed their animals.)
3. How do they live when roaming on the grasslands? (Answer: They live in mobile tents and carry everything they need with them.)
4. Who owns the grasslands people use to graze their animals? (Answer: The grasslands are a commons, owned by no one, though some people may have the rights to use certain sections of them and others may not.)
5. What is motivating people to overgraze the grasslands? (Answer: China is undergoing an economic boom, and increasing numbers of people want to buy meat and milk. The herders want to take advantage of the demand for their animals, so they want to raise as many as possible.)
6. How much did the number of grazing animals increase as a result? (Answer: From 100 million animals to 400 million.)
7. What is happening to the grasslands as a result? (Answer: Too much grazing kills the grass. Without the grass roots holding the soil in place, the soil can wash away in the rain and blow away in the wind. Without fertile soil and with continued grazing pressure, the grass cannot grow back. Ultimately, herders have to reduce the size of their herds because there is not enough forage to sustain them.)
8. What pressures are threatening the traditional Mongolian nomadic culture? (Answer: Environmental deterioration, notably soil erosion, is making it difficult to make a living. Increasing educational and employment opportunities in cities and town lure young people away from the traditional nomadic way of life.)

Grasslands in Kenya:

1. Why is so much soil washing into Lake Victoria and Lake Baringo? (Answer: Massive soil erosion.)
2. What is the impact on the fishing industry? (Answer: Declining fish harvests.)
3. Why is the erosion occurring? (Answer: Overgrazing the land destroys the vegetation that holds the soil in place.)
4. What is causing the overgrazing? (Answer: Significant human population growth around the lakes, leading to increased numbers of animals. Fewer people living a nomadic lifestyle, more people living year-round in villages. This forces livestock to focus their grazing on small areas close to villages, rather than spreading out over a wider area.)
5. What are some people doing about soil erosion? (Answer: They are planting native grasses and other plants which will hold the soil in place and provide fodder for stock.)

Grasslands in South Africa:

1. What are some ways in which the natural grasslands of South Africa (the Veldt) are ecologically important? (Answer: Habitat for over 800 species of wildflowers, 360 species of birds, and many wild mammals. Grasslands also absorb rainwater and release it gradually to streams, rivers, and lakes. This greatly reduces the risk of extreme cycles of floods and droughts.)
2. What are some ways in which people use the grasslands? (Answer: The grasslands provide natural medicines and grazing for livestock.)
3. What is the unemployment rate in rural South Africa? (Answer: Over 60%.)
4. How many people do the plantations of alien trees employ in South Africa? (Answer: 135,000.)
5. What happens to many of the trees? (Answer: They are sent to Japan, Australia and the United States to make paper and pulp.)

Grasslands in Argentina:

1. How many sheep could Patagonia support 70 years ago? How many can Patagonia support today? (Answers: 20 million 70 years ago, 8 million today.)
2. Why can't Patagonia support as many sheep as before? (Answer: Primarily severe overgrazing has led to soil erosion and a reduction in forage.)
3. As a consequence, how much of Patagonia is at risk of turning into a desert? (Answer: 80%.)
4. To the north of Patagonia lie the Argentine Pampas. What is the chief threat to these grasslands? (Answer: Conversion to croplands. This wipes out native vegetation, puts more insecticides and fertilizers into the environment, and reduces water storage in spongy grassland soils.)

Grasslands in the United States (New Mexico):

1. How large was the expanse of natural grassland, or prairie, that greeted the pioneers in the 19th Century? (Answer: 400 million acres.)
2. How many bison (buffalo) did this prairie support? (Answer: Roughly 30 million animals.)
3. What percentage of Americans were farmers 100 years ago? (Answer: 35%.)
4. What percentage of Americans are farmers today? (Answer: Less than 2%.)
5. What are people trying to do with the enormous Gray Ranch? (Answer: Maintain an environment that will prove healthy for wildlife, livestock, and a traditional way of life far into the future.)

What are some measures being implemented to bring this about? (Answer: Maintaining native vegetation, restricting the numbers of livestock that roam the ranch so that they do not overgraze, using fire to remove alien plant species and to encourage new and nutritious plant growth, employing traditional ways of managing the ranch.)

Episode #6 -- "HOT ZONES"

Overview

Fifteen million people worldwide die from insect and water-borne diseases each year. Among the killers: malaria, dengue fever, diarrhea, and cholera. Most of their victims live in the developing countries of Africa, Asia, and Latin America; most of the diseases afflicting them are preventable. Clean, potable drinking water, vaccines, mosquito control programs, and adequate health care are required, but too frequently developing countries lack the means to provide them.

To confront these diseases, people also need to consider the ways they contribute to the problem. Urbanization, with its associated wells, trash, and drainage ditches, provides ideal breeding places for the Anopheles and Aedes mosquitoes that transmit malaria and dengue fever, respectively. Drinking and bathing in water contaminated with human wastes can lead to diarrhea and cholera.

While many people in developed countries believe they are safe from these diseases so typical of poor, tropical countries, it is true that these diseases present a risk to us all. In the age of air travel, people, animals and insects, which are infected with disease-causing organisms such as the malaria blood parasite, can, and do, travel around the developed world. A recent example: the appearance in 1999 of West Nile Virus in New York City. Possibly carried by mosquitoes hitchhiking on planes flying from Africa, this potentially lethal disease has since infected thousands of people throughout the United States.

Insect and water-borne diseases also seriously impact the security and economies of both developing and developed countries. People debilitated with disease cannot be productive members of society. Economies stagnate, which affects commerce and prosperity worldwide in this era of the global marketplace. Meanwhile, people who are living miserably in unhealthy and impoverished places resort to desperate measures to change their lives. Civil strife, terrorism, and uncontrolled immigration to developed countries result.

Thus, unhealthy environmental conditions and inadequate health care in developing countries present serious problems for the developed world, as well.

Pre-screening Activities

Introduce the following key terms to the students:

- **Malaria** – a serious disease caused by several species of one-celled organisms that infect red blood cells in humans and other animals and that are transmitted by mosquitoes. Malaria kills hundreds of thousands of people worldwide each year.
- **Dengue Fever** – a serious disease caused by a virus that is transmitted by Aedes mosquitoes and that causes severe headache, fever, and pain in the joints. May be fatal.
- **Cholera** – a serious disease, caused by a bacterium and transmitted by ingestion of contaminated water, that causes severe diarrhea and fever. Unless treated, patients may become seriously dehydrated and die.
- **Yellow fever** – a deadly disease, chiefly of tropical regions, caused by a virus and transmitted by mosquitoes.
- **bacterium** – a one-celled organism, belonging to the kingdom Monera. Bacteria live everywhere on Earth; some of them cause disease in humans.
- **virus** – a nucleic acid, either DNA or RNA, wrapped inside a protein that reproduces only inside cells of living creatures. Difficult to define as either living or non-living. Some viruses cause disease in humans.
- ***E. coli (Escherichia coli)*** – a bacterium that lives in the intestines of humans and other animals and that is released into the environment in feces. In this way, *E. coli* can enter water supplies. Can cause severe diarrhea if ingested in food or drink.
- ***Aedes and Anopheles mosquitoes*** – two genera of mosquitoes. The *Aedes* mosquito transmits dengue fever; the *Anopheles* mosquito transmits malaria.
- **Pfisteria** – a strange aquatic protozoan that apparently lives in several different forms, one of which attacks fish. This form is thought to thrive in water contaminated with animal wastes and has been implicated as the culprit in some recent major fish kills, notably in North Carolina and the Chesapeake Bay.
- **mortality** – the proportion of deaths in a population.
- **morbidity** – the proportion of disease in a population.
- **epidemic** – the rapid spreading of a disease through a population.
- **pandemic** – epidemic over a wide geographic area.
- **contagion** – a contagious disease.
- **runoff** – water flowing over ground or pavement.
- **nutrient load** – the amount of nutrients that a body of water contains. Excessive nutrients are serious pollutants worldwide.
- **ecotourist** – a tourist that travels to experience natural wonders, such as forests and wildlife, often in exotic locales.
- **effluent** – a discharge of liquid waste, as from a factory or nuclear plant.

Post-screening Discussion

The topics in these activities could be covered in one lesson or extended into several lessons. The following viewing activities offer opportunities for student discussion of how their lives are inescapably tied to communicable diseases and the consequences of environmental degradation.

Malaria in East Africa:

1. How many people in Kombewa, at any one time, are infected with malaria? How many Kombewa children will die from the disease before they turn five? (Answers: 80% and 20%, respectively.)
2. What is the role of mosquitoes in spreading the disease? (Answer: Malaria is caused by a microscopic parasite that lives inside red blood cells. Mosquitoes spread the parasite by biting an infected person, taking in the parasites with their blood meal, biting another person, and injecting the parasites in the process.)
3. What is causing fish populations to decline in Lake Victoria, threatening the livelihood of people in Kombewa? (Answer: Raw sewage and agricultural run-off polluting the lake and over fishing.)
4. Why is malaria becoming more prevalent in Nairobi? (Answer: There are two reasons: 1) People infected with the malaria parasite in their blood are migrating to the city, where they can infect others, and 2) Human-caused alteration to the Nairobi environment is creating ideal mosquito breeding conditions.)
5. What is the unemployment rate in the Nairobi slum, Kibera? (Answer: 80%.)
6. What urban services does Kibera lack? (Answer: Running water, sewage, electricity, and garbage collection.)
7. What are some measures that people could take to reduce malaria infection? (Answers: Spraying for mosquitoes; covering and removing mosquito breeding areas, such as wells, old tires, and trash; using mosquito netting and repellent.)
8. Where can people find treatment for the disease? (Answer: Health facilities such as hospitals and clinics can provide medicines, usually quinine.)
9. If people know how to prevent the spread of malaria and how to cure it, why do you think so many people in East Africa are still coming down with the disease? (Answer: Extreme poverty prevents people from purchasing netting and repellents and from obtaining medicine, and prevents governments from sustaining mosquito control programs, establishing adequate health care facilities, and educating their citizens about changing their behaviors to reduce infection.)

9. Malaria used to be a serious and widespread disease in the United States. Why do you think we hardly see it anymore? (Answer: The United States had the resources, and local and national governments had the ability to implement effective mosquito control and infection prevention programs.)

Malaria and Dengue Fever in South America:

1. How much has the incidence of malaria increased in Peru? (Answer: From 1,500 cases in 1965 to 165,000 cases today.)
2. What did investigators find was the cause of the increase in Amazonian Indian villages? (Answer: Environmental changes caused by large-scale clearing of the jungle for farms and settlements created ideal breeding conditions for the Anopheles mosquitoes, which are the malaria vectors.)
3. How many people worldwide die from malaria every year? (Answer: Over two million, mostly in poor countries.)
4. How are humans creating ideal conditions for the dengue-carrying Aedes mosquitoes to breed? (Answer: They are leaving wells and basins uncovered and trash on the ground, all of which can hold stagnant water.)
5. How might malaria and dengue in Nairobi and Iquitos arrive quickly in the United States? (Answer: People can easily fly directly to these cities from the United States. Many who do so are tourists. While in Peru and Kenya, they can become infected and bring the diseases back to the United States in their bloodstreams. If Anopheles and Aedes mosquitoes then bite the infected people, they can spread the diseases to others. The mosquitoes, themselves, can also hitchhike in airplanes to the United States, and they can carry the malaria and dengue-causing organisms with them.)

West Nile Virus in New York:

1. How much does the United States spend annually to screen infectious diseases from entering the country? (Answer: \$350 million.)
2. How did people think West Nile virus arrived in the United States? (Answer: An infected mosquito on a plane traveling from Africa to New York.)
3. How many people has it infected? (Answer: Thousands.)
4. Why are people investigating dead crows and other birds? (Answer: The West Nile Virus also infects and kills birds. The virus was first discovered in birds. Now, by investigating dead birds, scientists can determine how common the virus is and where it has spread.)

Water-borne Diseases in Peru: Diarrhea and Cholera:

1. How many people worldwide are estimated not to have access to clean drinking water? (Answer: 1.1 billion.) How many people are thought not to have access to basic sanitation services? (Answer: 2 billion.)
2. What causes diarrhea? (Answer: A host of microorganisms that cause illness when ingested.) What causes cholera? (Answer: Drinking water contaminated with the bacterium *Vibrio cholerae*.)
3. What is El Niño? (Answer: It is a major weather pattern that occurs every four or five years, with the most dramatic effects being seen in the Pacific Ocean. Torrential rains come down over deserts, wet areas experience drought, and prevailing wind and ocean current patterns change. In the case of Peru, warm tropical ocean water replaced the cold water that normally flows offshore, leading to a bloom of plankton that harbored the cholera bacterium.)
4. How did the shantytown Villa El Salvador successfully confront unhealthy living conditions? (Answer: The town organized and obtained electricity, clean drinking water, central sewage, and community health centers.)

Water-borne Diseases in Bangladesh:

1. How crowded is Bangladesh? (Answer: 135,000,000 people in a country the size of New York State.)
2. Why is cholera more prevalent in Bangladesh than in Peru? (Answer: The climate, the country's fresh water, and the ocean water offshore are all warmer, encouraging the growth of plankton in which the cholera bacterium lives. Massive annual floods, brought about by the monsoons, deposit contaminated water throughout the ponds and streams that people use for drinking water. Thus, Bangladesh's population density, poverty, climate, and geography all conspire to give the country the highest rate of cholera infection in the world.)
3. Why is finding a solution to the shortage of safe drinking water in Bangladesh so difficult? (Answer: Ground water tapped by over five million wells in the country contains dangerous amounts of arsenic. Another source of water needs to be found, but this is very difficult in such a poor, crowded country.)

Diseases Afflicting Aquatic Life in the Chesapeake Bay:

1. What pollutants entering Chesapeake Bay are thought to be harming aquatic life? (Answer: Poorly treated sewage, pesticides, eroded soil, fertilizers, and industrial effluent.)
2. What is the connection between these pollutants and the diseases attacking oysters and fish? (Answer: The connection is not yet clear, but pollutants are suspected of weakening oysters so that they are susceptible to diseases, and they are thought to be altering water conditions in Chesapeake Bay so that the toxic algae, *Pfiesteria*, and certain species of fungi can thrive. Both of these organisms are believed to attack fish, but the relationship between them is not yet clear.)

Conclusion:

1. What can people do to reduce water-borne diseases? (Some possibilities: Construct central water and sewer systems, educate people about sanitation measures they can implement, increase health care facilities, reduce water pollution by sewage, agricultural runoff, and industrial effluent.)
2. What can people do to reduce mosquito-borne diseases? (Some possibilities: Eradicate mosquitoes and their breeding grounds, provide mosquito nets, educate people about altering mosquito habitats in their neighborhoods, increase health care facilities.)
3. How can water-borne and mosquito-borne diseases in poor, developing countries affect us in the United States? (Some possibilities: Economically: If people are debilitated, they cannot work, so they cannot produce goods and services to sell and cannot earn money to buy exports from the United States. Loans from the United States, multi-lateral banks, and other sources cannot be paid back. Health: Diseases can spread around the world, carried by infected people, mosquitoes, etc. Security: Poor, unhealthy people can be desperate enough to try extreme measures to improve their lives. Violence and insecurity can increase which, in turn, can threaten people in the United States. Desperate people can also decide to immigrate illegally to the United States, overwhelming the country's law enforcement monitoring its borders. Peace of Mind: People in the United States can be touched deeply by the suffering beyond the country's borders.)

Episode #7 -- "FUTURE CONDITIONAL"

Overview

"Future Conditional" explores how toxic pollutants affect environmental and human health. Viewers discover that pollutants travel great distances, affecting human and natural communities hundreds and even thousands of miles away. Case studies illustrate how Arctic food chains and the Inuit people are being poisoned by toxins being created in North and Central America, Europe and Asia; how poor factory workers in Mexico are being exposed to dangerous pollutants brought about by the new global economy, and why once-thriving fishing villages around the Aral Sea are now ghost towns, a situation that is a powerful wake-up call about the future of California's Salton Sea.

The program also introduces a Barrio neighborhood in San Diego that, by successfully confronting political and business interests polluting their neighborhood, demonstrates the power that ordinary citizens have to bring about positive change in their communities.

Pre-screening Activities

Introduce the following key terms to students:

- **Inuit** – A people who live in the Arctic from northeastern Russia across Alaska and Canada to Greenland. Formerly referred to as Eskimos.
- **The grasshopper effect** – A description of how air-borne toxins can infect localities distant from their sources of origin. Toxins can evaporate, travel by wind for hundreds and even thousands of miles, and then return to earth in rain and snow.
- **Plankton** – Organisms that float in fresh and salt water. The term includes animals as large as jellyfish, but usually refers to microscopic creatures. Phytoplankton refers to photosynthetic organisms, such as floating algae; zooplankton refers to animals and other creatures that eat other organisms for sustenance.
- **North American Free Trade Agreement or NAFTA** – A treaty passed in the United States in 1993 that promotes free trade between the United States, Canada, and Mexico.
- **Barrio** – A Spanish term meaning neighborhood.
- **Marco Polo (1254-1324 A.D.)** – A Venetian merchant who traveled to China and spent 17 years with the emperor, Kublai Khan, the grandson of Genghis Khan (see below). His written account of his travels and time in the Chinese court achieved widespread readership in Europe.
- **Alexander the Great (356-323 B.C.)** – King of Macedonia when he was 18, Alexander the Great embarked on a campaign of conquest that, at its completion, extended through the Middle East to Central Asia and India and south to Egypt. He died when he was 32 years old.

- **Genghis Khan (Died 1227 A.D.)** – Leader of the Mongols, a nomadic people from present day Mongolia. Genghis Khan, through armed conquest, formed the largest contiguous empire the world has ever known, stretching from China through Central Asia to Eastern Europe. His armies were known for their ruthlessness and cruelty as well as their effectiveness.
- **Karakalpak People** – A Turkic people living near the Aral Sea.
- **Silk Road** – An ancient trade route that caravans would travel transporting goods from China to Europe.

Post-screening Activities

The topics in these activities could be covered in one lesson or extended into several lessons. The following viewing activities offer opportunities for student discussion of how their lives are inescapably tied to the environment.

Toxic Pollution in the Arctic (Canada):

1. In what ways is hunting important to the Inuit? (Answer: Over 65% of their protein comes from wild animals. In addition, it is essential to preserving cultural identity and to developing the character of Inuit young people.)
2. What might happen to the Inuit if hunting were to disappear, either because the animals have disappeared or because they are so laden with toxins that they cannot be eaten? (Possible answers: Inuit would have to depend upon different store-purchased food. Such a shift in diet often leads to health problems, such as diabetes and heart problems, in people who are not accustomed to the new foods. Their cultural identity might weaken, and, since age-old traditions of raising children might be threatened, social problems might afflict Inuit young people.)
3. The skills and knowledge Inuit possess to thrive in their difficult environment and to successfully hunt the animals found there have been passed down generation by generation for millennia. If Inuit were to lose this knowledge, would this be important to those of us who are not Inuit? How important do you think it is to preserve such age-old skills and knowledge in the modern world?
4. The program states that “The discovery of toxic pollutants in the food supply has put 155,000 Inuit on the brink of a public health disaster.” To avoid being poisoned, they must either change their dietary customs, or the United States and other countries must spend huge amounts of money cleaning up the pollution they are creating. What do you think should be done? What do you think will be done?

5. If toxins are showing up in the bodies of people living in the Arctic, do you think they are showing up in yours? (Answer: What is happening in the Arctic may not be happening in your neighborhood, even though it is probably closer to pollution sites than the Arctic is. First, the climate and weather patterns seem to concentrate toxins in the Arctic environment. Secondly, Inuit eat seals that are farther along the food chain than plant-eating animals like cattle and chickens. The farther you move along the food chain, the more concentrated toxins become. Nonetheless, there is no reason to suppose that we are not taking in and accumulating toxins in our air, water, and food.)

Toxic Pollution in Tijuana (Mexico):

1. What is the trade-off that Mexico made regarding jobs and environment (Answer: Mexico encouraged U.S. factories to settle in Mexico because they provide employment for Mexicans. The factories, however, increase toxic pollution.) Looking at this situation, do you think the trade-off was worth it?
2. What is the United States' responsibility in this situation? Should the U.S. help clean up this site, treat people who are sick because of it, and even compensate families financially for the suffering they have undergone? Or, is this the Mexican government's problem?
3. As a follow-up to Question #2, if a United States company establishes a factory in a developing country, is it responsible for pollution problems it creates even if the developing country's environmental regulations are so weak or poorly enforced that the pollution is allowed to continue?

Citizen Action In Barrio Logan (San Diego):

1. Barrio Logan is in a congested, polluted part of San Diego. Why do you think residents fight so hard to stay in the neighborhood and preserve it?
2. Do you know of any instances where people have tried to unite to achieve a common cause in your neighborhood? If so, what happened?
3. What did the people try to do, what strategies did they use, and how much success did they enjoy?

The Plight of the Salton Sea (California):

1. Why might Palm Springs appear to be an unlikely place for public health problems brought about by environmental pollution? (Answer: It is an affluent community, whose residents can afford to live away from areas with polluting industries.)
2. What are two ways in which the lake is being threatened? (Answer: Agricultural runoff carries huge amounts of chemicals into the lake that are killing fish, birds, and other life. Secondly, water is being diverted from agriculture to San Diego and other Southern California municipalities, thus reducing the flow of water into the lake and causing it to shrink. This scenario is similar to what has happened to the Aral Sea.)
3. Considering the Aral Sea predicament, what should people do about the Salton Sea? Should agricultural pollution be reduced? Should water be taken away from cities and returned to the farmers? What might be the consequences if nothing is done?

The Bizarre Case of the Aral Sea (Uzbekistan):

1. What is the connection between wind-borne toxins and the drying up of the Aral Sea? (Answer: The toxins entered the sea from agricultural runoff. When the sea evaporates, it leaves the toxins behind. The wind blows the new-dry land, now containing the toxins, throughout the area.)
2. How has the drying up of the sea increased poverty? (Answer: The sea used to support a vibrant fishing industry, which is now deteriorating along with the environment that supported it. It's hard to fish when you live 90 miles from the water!)
3. What is threatening cotton farming in the region? (Answer: The quality of the river water being used for irrigation is itself deteriorating, due to increasing concentrations of salt and agricultural chemicals. In addition, salt left behind by the evaporating sea is blowing through the fields, greatly increasing their salinity. Crop yields are decreasing significantly as a result. In addition, because of wind-borne toxins, the farmers and their families are less healthy than before.)
4. Do you think we can use the Aral Sea as a realistic example of what could happen with the Salton Sea and Southern California, or do you think that is too far-fetched? Why or why not?

Episode #8 -- "STATE OF THE PLANET"

Overview

"State of the Planet" takes a brief look at four different environmental topics: water issues, the threat of food shortages, human population growth, and global warming. These issues are likely to have a significant impact on the future well-being of Earth's environment and the people who depend on it for their needs and wants. At the root of these issues is a dramatic human population growth rate that is putting ever-increasing pressure on the Earth's resources and natural systems. Most of this growth is occurring in the world's poorer countries, putting enormous strains on their water supplies and ability to feed their citizens. "State of the Planet" discusses how food and water problems are threatening the future of developing countries.

But environmental problems are also affecting the United States; for example, "State of the Planet" illustrates how water shortages are threatening agriculture in the United States. Population growth is also increasing in the United States, and this is of major global significance because U.S. citizens, on average, use far more energy and natural resources than people elsewhere. Our energy consumption, chiefly our burning of the fossil fuels coal and oil, is the main cause of human-created global warming. As our numbers increase so will our environmental impact. At present, global warming presents perhaps the most difficult and serious environmental issue confronting the world today.

Yet, increasingly, people are focusing their commitment and ingenuity on solving environmental issues, and "State of the Planet" takes a look at some of these. These examples serve as a beacon of hope that ultimately we will learn to live in harmony with the planet's natural systems and ensure a bountiful future for us and for future generations.

Pre-screening Activities

Introduce the following key terms to students:

- **Aquifer:** An underground source of water
- **Developing World:** Regions and countries of the world where people have little money or economic opportunity and where living conditions are inadequately providing for people's needs and wants
- **Ecosystem:** How everything – plants, animals, soil, weather, etc. - in a certain place – a school yard, a park, a region, etc. – is interconnected
- **Fertility Rate:** The average number of children being born to women in a particular group
- **Floodplain:** Land that sometimes is covered by water from overflowing rivers, streams, and lakes
- **Fossil Fuel:** Fuels, such as coal and petroleum, that formed from ancient plants and animals
- **Fungicide:** A chemical that kills fungi
- **Genetic Engineering:** Changing the genes of living things so that the living things are somehow different
- **Global Economy:** The buying and selling of goods and services around the world
- **Life Expectancy:** The average lifespan of a group of people
- **Malnourished:** Not having enough of the nutrients needed for good health
- **Non-profit Organizations (NGOs):** Organizations that are primarily trying to help society, not make money
- **No-till Farming:** Planting crops without plowing the soil first
- **Renewable Resource:** A natural resource that can replace itself, such as trees and fish
- **Wastewater:** Water that carries the wastes from human activity, including wastes from industries, households, and the surfaces of streets and sidewalks

Post-Viewing Discussion

Threats Concerning Human Population Growth

- How rapidly is our population increasing today? (Answer: Roughly 78 million people/year or 10,000 children being born during the time this show was on the air)
- Many people and organizations believe it is crucial for the future well-being of people and the environment to slow down the rate at which human populations have been increasing. Is progress being made? (Answer: Yes, the rate of human population growth has slowed significantly in recent years. Today people predict that population numbers will increase to 9.5 billion and then begin to slowly decrease.)
- Most population growth is occurring in developing countries. What are the chances a baby born today lives in the United States or another rich country such as Japan, Canada, Australia, or a European country? (Answer: Over five out of six people on Earth live in poor countries. If you happen to live in a rich country, you are in a true minority. Statistically, you were much more likely to be born in a poor country!)
- The population of the United States, however, is also growing. Why does the film say that this is significant? (Answer: Americans use far more natural resources and energy than anybody else. As our numbers increase, we will therefore use up more and more of the planet's resources, which will have major human and environmental consequences. For instance, we burn far more coal and oil per capita to meet our energy needs. This is thought to be the main cause of global warming. With more of us, we will burn more coal and make global warming more severe, if we keep behaving the way we do today.)

Threats Concerning Water

- What are three water problems that are affecting people in developing countries? (Answer: water shortages, water pollution, and water-related diseases)
- What water problem is afflicting farmers in the United States? (Answer: water shortages)

Threats Concerning Food

- According to the film, what is the main food-production problem afflicting the world today? (Answer: Food distribution, not food production. We are growing enough food to feed the world's billions, but we are not always successful at getting the food to the people who need it.)

- Why does the example of China give us hope about feeding the world? (Answer: Until recently, China used to experience severe famines that killed millions of her citizens. Now very few go hungry, even though China has to feed over 1.2 billion people.) What might be threatening China's success? (Answer: Economic pressure is causing China to expand industrial production, so factories are taking over good farmland, and skilled farmers are leaving their fields to work in them.)

Threats Concerning Global Warming

- According to the film, what are four types of evidence that global warming is occurring? (Answer: 1. receding glaciers; 2. species of plants and animals appearing in places where they have been unknown; 3. rising sea levels; 4. severe heat waves)

Confronting Environmental Threats: New Ideas

- The film shows several innovative measures that people are implementing to better manage our environment. What are they, and what problems are they addressing? (Answer: 1. no-till farming that reduces soil erosion; 2. plant breeding that will enable farmers to grow more crops in difficult environments like deserts; 3. wind generators that can reduce our dependence on fossil fuels, which contribute to global warming)
- After viewing the film, are you more or less worried about your future? What worries you the most, if anything? What do you think we need to do to ensure that you and the planet's environment have a healthy future? What do you think we need to change?

Episode #9 -- "STATE OF THE PLANET'S WILDLIFE"

Overview

This film looks at the challenges wildlife is facing throughout the world. Extinction has always been a natural part of Earth's history; five major extinctions have occurred in Earth's past in which a large number of species went extinct in a relatively short period of time, at least geologically speaking. Perhaps the most well-known of these extinctions was that of the dinosaurs 65 million years ago. The cause is believed to have been a huge asteroid slamming into the Earth. The causes of the other extinction episodes are unknown, but they are surely the result of titanic geological, meteorological, or astronomical phenomena. Now, many scientists believe that we are beginning to experience a sixth mass extinction. This one, however, would be the first created by another animal species, namely our own, Homo sapiens.

"The State of the Planet's Wildlife" examines some of the ways in which we are threatening the survival of Earth's living creatures. Human population growth and the development it creates, the poaching of animals for food and for a wide variety of products ranging from ivory to furs, and global warming are all having dramatic impact on wildlife populations around the world. But, the film will also show how innovative and concerned people are successfully working to protect wild species. The threats wild creatures are facing in the 21st Century are daunting, but hopes for saving them remain robust. The first step is to become informed. This film is intended to help.

Pre-screening Activities

Introduce the following key terms to students:

- **biodiversity**: the variety of all organisms living on Earth or in a particular region
- **browsers**: animals such as deer and domesticated animals that eat grass, trees, and other plants
- **clear-cut**: an area that has had all trees removed for logging; such areas often suffer from soil erosion because the tree roots that have held the soil in place are removed
- **commodities**: products that can be bought and sold
- **dispersers**: animals that unknowingly disperse fruits and their seeds (through scat after eating them, by carrying them in their fur, feathers, or feet, etc)
- **ecosystem**: how everything—plants, animals, soil, weather, etc.—in a certain place—a school yard, park, a region, etc—is interconnected
- **endangered species**: a species in such small numbers that it is considered at risk of extinction. Animals that are “officially” declared endangered are put on an endangered species list either at the state or national levels
- **exotic pet**: an animal from another part of the world that is kept as a pet
- **globalization**: to make global or worldwide in scope
- **indigenous plant**: a plant that is native to a particular region or area and is not naturally found in other parts of the world
- **old growth trees**: very old trees that are part of a mature forest ecosystem that has not been logged
- **over grazing**: putting too many grazing animals on a piece of land so that much of the vegetation is removed and cannot grow back. Erosion is a result and soil is lost, making it more difficult for the plants to re-establish themselves.
- **pollinator**: animals such as insects, birds, bats, and some mammals that visit flowers and unknowingly pollinate the flowers. The relationship between pollinator and plant is often critically important to both species.
- **savannah**: a grassland with scattered trees, typical of East Africa
- **shantytown**: A town that people on their own just constructed with whatever materials they happened to find. They are usually built next to cities and usually lack basic services like running water and electricity. Typically, only the very poor live in them.
- **silting**: the washing of soil and other fine particles into streams as a result of erosion. High amounts of silt can clog the gills of fish, affect the visibility in streams, and even clog streams up.
- **soil erosion**: soil washing or blowing away by wind, water, or ice
- **squalor**: poverty, neglect
- **urbanization**: development of land to make it urban in nature
- **wildlife corridor**: undeveloped stretches of land that connect wild areas together, allowing wildlife to move from one area to another even with human development

Previewing Discussion

To help students put the video in perspective, ask them the following questions:

- What challenges do you think wildlife is facing around the world? Why do you think species are on the endangered species list?
- Do you think the challenges facing wildlife are the same throughout the world, or do you think it varies from region to region?
- How do you feel when you think about the idea that we may be entering a sixth mass extinction of animals? This means that during your lifetime, you may see many species go extinct.
- What does wildlife mean to you? Is it important to you that animals such as lions, bears, and pandas exist in the wild, even if you never see them yourself? Or, is it OK with you that some of them exist only in zoos?

Post-viewing Discussion

1. How unusual is the current extinction threat? (Answer: VERY unusual! Only five instances of comparable species loss in the past 4.5 billion-year history of the Earth are known. If we do not turn the current situation around, we will be witnessing the 6th major extinction episode on the planet.)
2. Why is it difficult for China to feed its citizens by itself? (Answer: China's population is 1.3 billion people, roughly 22% of the world's total. That's a lot of people to feed. China does NOT occupy 22% of the Earth's surface, and much of its territory consists of deserts and mountains, unsuitable environments for intensive agriculture.)
3. What is the connection between China and the Brazilian Amazon? (Answer: China relies on poultry and pork production to help feed its enormous population. The pigs, ducks, and chickens require feed made from soybeans. Brazilian farmers, responding to the demand, are burning and clearing the Amazonian rainforests and replacing them with soybean fields.)
4. What is the connection between exotic tree plantations in South Africa and Japan and the United States? (Answer: The trees are being planted to supply paper mills in the latter two countries.)
5. How is overgrazing in Kenya causing Lake Baringo to fill up with silt? (Answer: Overgrazing removes grasses and other plants that hold soil in place. Wind and water carry the unprotected soil into Lake Baringo. Planting grasses on the soil can significantly reduce this erosion.)

6. How is urban and agricultural development outside the Everglades affecting the Everglades itself? (Answer: Most of the water in the Everglades flows into this vast wetland from outside the area. Polluting water outside the Everglades and diverting its flow elsewhere thus affects both the quantity and quality of the water inside the area.)
7. What is the connection between poverty and the killing of wild animals? (Answer: Impoverished people are often hungry, and wild animals can serve as an available source of food. The selling of wild animals for medicines, pets, trophies and other products also can provide much-needed income.)
8. Uncontrolled killing of wild animals will lead to their disappearance, thus eliminating needed sources of food and income. Why, then, don't people reduce how many animals they are killing so that they can be confident that sufficient animals will be around in the future? (Answer: Nobody "owns" wild animals. They are a commonly-held resource. People typically have no incentive to preserve such resources; if, for example, a person encounters a wild animal and refuses to kill it, there is no guarantee that the next person that comes along will do the same. The first person will have deprived herself of the animal, but the animal will not have benefited. Thus, commonly-held resources like forests, grasslands, fisheries, and wildlife tend to be over-exploited. This is called "The Tragedy of the Commons". Also, impoverished people are often so desperate that they can only worry about surviving the present, not preserving the future.)
9. How will global warming threaten polar bears, living in one of the coldest places on Earth? (Answer: Polar bears hunt seals that come out to rest on the ice that covers the Arctic Ocean during the colder months of the year. Once the sea ice dwindles during the summer, many of the bears must fast until the ice returns. Consequently, the bears must eat a great deal of food to tide them over during the warm season. With global temperatures rising, the Arctic Ocean ice is appearing later in the Fall and disappearing earlier in the Spring. Ultimately, the bears may not have enough time on the ice to obtain the food they need to nourish them throughout the year.)
10. How will global warming threaten African wildlife? (Answer: In two ways. First, in the face of increasing temperatures and dwindling water supplies, animals may find it more difficult to find sufficient food and water. Secondly, these climate conditions should make it more challenging for farmers to grow crops and graze animals. Increasing poverty will force many of them to hunt wild animals for food and income.)

11. How does the burning of coal and petroleum in the United States and other countries affect the welfare of animals in the Arctic, Africa, and elsewhere? (Answer: Burning coal and petroleum releases millions of tons of carbon dioxide and other gases into the atmosphere that are believed to be the cause of global warming. These gases are therefore called “greenhouse gases.” Energy conservation measures, such as riding a bike instead of driving and turning down the thermostat in your home during the winter, reduce the amount of greenhouse gases in the atmosphere, thus slowing the rate of global warming and reducing the threat of climate change.)
12. Grizzly Bears live in Glacier National Park in northwestern Montana, where they are protected. Sometimes they leave, however, entering privately-owned land on adjacent plains. Why don't they stay put where they are safe? (Answer: Frequently, the bears must find food in habitats that lie outside the national park, often in areas of lower altitude.
13. Formerly, when bears would appear on private ranch land, the ranchers would eliminate them, because they considered the bears threats to their cattle. Why do some ranchers, at least, regard the bears differently today and work to protect them? (Answer: The students may infer that the ranchers admire the bears and consider them integral parts of the magnificent territory in which they live. As one biologist says, the bears' presence “means that we've got an intact landscape. It means something bigger than just those critters.” The ranchers also appear to believe that they can figure out how to keep the bears and still protect their cattle.)
14. How are new technologies and techniques helping people to save the bears and prosper economically at the same time? (Answer: The film shows a few examples: Specially-designed fences that allow bears to pass but keep cattle from wandering, new machinery that allows selective timber harvest while reducing damage to the forest environment, radio-collars that help biologists track the movements of grizzly bears.)
15. Why might it be difficult to achieve the same results in developing countries? (Answer: These countries might not have access to the technology and expertise available in Montana.)

16. Zoos are enormously popular, and offer most people the only opportunities they will have to view rare and exotic animals such as cheetahs, tigers, and gorillas. They are also controversial at times, as some people feel they cruelly hold animals captive which should be wild and free. Have a discussion with your students to explore how they feel about zoos. You can pose the following questions:

- Is it important to have zoos, so that people can see animals they would not encounter otherwise, learn about them, and become concerned for their welfare? If people could not see these animals, would they care about them as much? Is it important to keep some animals captive to fill the role as “ambassadors” for their kind?
- Zoos are important breeding centers for many species of endangered animals. Is it worth keeping some animals captive so that we can ensure that at least some representatives of endangered species can breed safely?
- Would it be satisfactory to you if animals such as gorillas and polar bears were to become extinct in the wild and exist only in captivity? Is it important to you to have these animals in the wild, as well?
- Zoos, of course, can only hold a tiny percentage of the world’s wild creatures. For example, the vast majority of animals on Earth are invertebrates, such as insects, sponges, spiders, and shrimp. Is it important to you to preserve these creatures in the wild, or is it satisfactory to you to only preserve large, attractive, and spectacular creatures in zoos?

17. Grizzly bears are rare in the lower 48 states, and their future is uncertain. They require large amounts of wild country to survive, their behavior (e.g. preying on livestock, pilfering beehives) often runs them afoul with humans, and they are unpredictable, dangerous animals who have been known to seriously injure and even kill human beings. Two national parks where they live are Yellowstone and Glacier. Millions of people visit these parks every year, many of whom are unfamiliar with bears and how to avoid trouble with them. Ask your students how they feel about the presence of grizzlies in these national parks. Do they pose too much of a risk to visitors to live there? Should they only be allowed to live in more remote, less visited areas? On the other hand, what do the grizzly bears add to the national parks? Would they be diminished without the bears? Would visitors, free from the worry of dangerous bear encounters, find their visits to Glacier and Yellowstone more enjoyable? Or, do you think they should find it worth a little risk to be in a place sufficiently wild and pristine to harbor bears? If your students prove to have a range of opinions on the matter, you might want to have a class debate.

Episode #10 -- "STATE OF THE OCEAN'S ANIMALS"

Overview

"The State of the Ocean's Animals" examines some of the ways in which humans are threatening the survival of ocean animals. Extremely efficient, but ecologically destructive, fishing techniques threaten many of the ocean's big fish; the demand for seafood delicacies and fear threaten the world's sharks; global warming and the damming and diversion of rivers threaten yet others. And, not only ocean animals are at risk; a huge number of the world's people relying on this marine bounty for food and livelihood are, as well. But, the film also shows concerned and dedicated people who are working hard to learn about ocean animals and to educate and motivate people to help preserve them. The threats facing ocean animals in the 21st Century are daunting, and "The State of the Ocean's Animals" challenges our generation to understand the problems and take action.

Previewing Activities

If students do not know the following locations, use a wall map, desk map, or atlas, to familiarize them with the geographical areas profiled in the video:

- A. North America
 - New Bedford, Massachusetts
 - Melbourne Beach, Florida
 - Klamath River, Northern California
 - Monterey Bay, California

- B. Africa
 - Senegal

- C. Antarctica

- D. Japan

The following terms are used in the video and may need to be introduced to students:

- Biological diversity: the variety of all organisms living on Earth or in a particular region
- By-catch: the marine organisms caught in fishing nets that are not marketable; they are often killed and thrown back into the sea
- Clear-cutting: usually this term refers to a practice in which all trees in a forest are cut down; in this case it refers to fishing nets that remove all ocean life in their path, including species that are undesirable or unwanted
- Dead zones: a large area in a body of water where conditions cannot support life, often due to oxygen depletion
- demonization: to portray particular things, such as sharks, as evil
- drag net or trawl net: a fishing net that is dragged along the bottom of the ocean, gathering everything in its path and incidentally destroying habitat
- extinction: when a species dies out; there are no more individuals left alive
- indigenous people: a group of people native to a particular region or area
- infectious disease: a disease caused by a microorganism or other agent (bacterium, fungus, or virus) that enters the body of a living organism
- migration: in this case, when fish return to the streams in which they hatched to lay eggs
- predator: an organism that preys upon or eats other organisms
- prey: an animal that is eaten by another animal
- reproductive rates: the total number of births expected for a group of female animals over their lifetime
- spawning: the act of fish depositing their eggs
- trawler: a fishing boat that uses nets dragged along the bottom of the ocean floor

Previewing Discussion

To help students put the video in perspective, ask them the following questions:

- What challenges do you think ocean animals (fish, shark, whales, dolphins, etc) are facing around the world? Do you know examples of ocean animals that are facing big threats?
- Do you think the challenges facing ocean animals are the same throughout the world, or do you think it varies from region to region?
- What do ocean animals mean to you? Is it important to you that animals such as porpoises, whales, and penguins exist in the wild, even if you never see them yourself? What about species such as sharks, which the media often portrays as dangerous and evil? What would a world without these creatures feel like?
- In what ways are people's lives affected by a decline in ocean animals?
- What responsibility does our generation have to resolving the threats to ocean animals?

Viewing Activities

Segment One Topic: Over-fishing

This segment focuses on the Atlantic cod fishery off New England. This fishery has essentially collapsed due to highly sophisticated fishing equipment and techniques that have caught so many fish in recent decades that there are simply not enough cod left to support the fishermen. Large ships drag vast nets along the bottom of the ocean, pulling up all ocean life in their paths and tearing up vital habitat. Many of the organisms brought up in the nets aren't marketable; known as "by-catch" they die and are thrown back into the ocean. With fish populations depleted, fishing boats often move into new fishing areas, threatening fish populations that local, often poor, people rely upon. This is happening in parts of Africa, such as Senegal, and other parts of the world.

Finding Segment One (Length: 7 minutes and 30 seconds)

(Visual and audio cues: Start when you see a beached whale and Matt Damon asking, "How could this have happened? How could we have allowed so many of our ocean animals to be on the brink of extinction?" Stop with a scene of a Senegalese fish market and Roger Payne saying, "What happens when you remove this source of protein? Well, I think you have a problem.")

Segment One: Post-viewing Discussion

1. Why are many fishing vessels rusting and sitting idle at the docks in New Bedford, Massachusetts? (Answer: There aren't enough cod left in the ocean to make it financially worthwhile to go fishing. Boats cannot make enough money to run the boat and to pay fishermen, much less to make a profit)
2. Why are trawlers called "killing machines?" (Answer: They drag long nets along the bottom of the ocean. These nets can pull up huge amounts of fish as well as everything else in their path, and can destroy their habitat in the process. These huge ships only process and freeze certain fish species; everything else is thrown overboard as "by-catch.")
3. People often use the term "harvesting the world's oceans." Why is this a misleading term to use? (Answer: People "harvest" what they have grown, and, if they want to keep "harvesting" year after year, they make sure to plant and raise new plants and animals. In contrast, nobody grows the ocean's fish; we simply take them and hope that nature replaces them. "Hunting" and "gathering" describe the practice of fishing more accurately than "harvesting".)
4. Why are people in the developing world especially vulnerable to over-fishing? (Answer: Large, mechanized fishing vessels that no longer catch enough fish in their traditional waters often move into new areas, such as off the coast of Africa. Local fishermen simply cannot compete with the large "factory" ships. The large ships also remove the fish that local people rely on as a food source.)
5. If fishermen rely on having enough fish to make a living, why do they take too many fish? Aren't they hurting themselves? (Answer: Nobody owns marine fish; they are available to anyone who can catch them. This means that it often does not pay for a fisher-person to restrain herself and intentionally leave fish alone so they can reproduce and keep the fishery going. If, say, fisher-person A leaves the fish alone, what is to prevent fisher-person B from coming along and taking the fish himself? Fisher-person A will have lost some fish, but the fish populations will not have benefited from his actions. And so, even those who know over-fishing is threatening their livelihood often persist in catching too many fish because they figure somebody else will catch the fish if they don't.)

Segment Two: Pop Culture and Its Effects on Ocean Animals

In 1975, the novel *Jaws* tapped into a primordial human fear that its author, Peter Benchley, has worked tirelessly to counteract ever since. Shark populations worldwide are dropping dramatically. Fear of sharks is contributing to this steady decline, but more significant is the demand for delicacies such as shark fin soup. Each year, people slaughter 100 million sharks, usually cutting off their fins and throwing the fish back into the ocean to die. This segment questions the morality of this cruel practice and expresses concern for the future of this spectacular ocean predator.

Finding Segment Two (Length: 6 minutes and 45 seconds)

(Visual and audio cues: Start when you see an open water scene and Matt Damon says, “This raises a fundamental question that is at the very heart of our investigation....” Stop when you see a rocky coast scene and Matt Damon says, “Fortunately there are places where communities and scientists have joined forces to find ways to co-exist with the natural world.”)

Segment Two: Post-viewing Discussion

1. Why is it difficult for shark populations to rebound? (Answer: Their reproductive rates are slow. It can take many years for females to reach reproductive age, and, once old enough, they often produce only a few young each year.)
2. Why is the killing of sharks referred to as a “buffalo hunt”? (Answer: American buffalo, or bison, were once killed just for their tongues. Similarly, many sharks are caught simply for their fins to make a costly food delicacy—shark fin soup. The rest of the shark goes to waste.)

Segment Three: The Effects of Global Warming on Ocean Animals

Section Three describes how global warming is menacing the continued survival of sea turtles and emperor penguins. Global warming is causing ocean levels to rise, which may drown the beaches where sea turtles lay their eggs. Global warming may also melt the sea ice surrounding Antarctica upon which emperor penguins rear their young. The film, however, illustrates efforts to preserve these extraordinary animals. In Melbourne Beach, Florida, people are determined to keep their beaches welcoming to nesting Loggerhead sea turtles. Carefully marking turtle nest sites so they are not disturbed, community residents are rewarded by the enthralling sight of baby turtles making their way to the sea. Meanwhile, in Antarctica, scientists brave extreme cold to study penguins so we can know how best to protect them. The future of these, and other, animals, however, remains uncertain in the face of global climate change.

Finding Segment Three (Length: 13 minutes and 20 seconds)

(Visual and audio cues: Start when you see the scene of a sea turtle swimming through sea grasses and you hear “Like the shark, sea turtles have been wandering the oceans of the world for millions of years...” Stop when you see a whale shark and fish swimming and you hear “There is a whole set of thousands of species that depend upon the ebb and flow of the seasons, the ebb and flow of the currents in order to set the scales of their lives and all of those are going to change and very quickly with global climate change.”)

Segment Three: Post-viewing Discussion

1. Sea turtles have survived on Earth for millions of years, but why are they threatened today? (Answer: Sea turtles return to their birthplace to lay eggs in the sand. Many nesting beaches, however, are now unavailable to them, having been developed into resorts, public beaches, and beach communities. Sea turtles are also threatened in some places by uncontrolled egg collecting and hunting for food and by accidental drowning in fishing nets. Long-term, global climate change may drown vital nesting beaches.)
2. Why is Melbourne Beach, Florida such a success story for loggerhead turtles? (Answer: The community monitors the beaches at night and marks the locations of sea turtle nests so people won't disturb them during the day. The local population of turtles has nearly doubled.)
3. Why do sea turtles need a lot of beach to sustain their population? (Even though one turtle may lay 100 eggs at a time, only one baby in 10,000 will reach maturity. Most of them become prey to other animals.)

4. It appears that the loggerhead turtles at Melbourne Beach are in good hands. Why is there a concern about the turtles 30 years from now? (Answer: It takes a young turtle about 30 years to become old enough to reproduce. When they return in 30 years, the beaches that exist now may be underwater due to sea level rise caused by global warming. It may be difficult for them to lay eggs further inland because houses and other human construction may be blocking the way.)
5. What hopeful signs are there for saving these turtles? (Answer: Dedicated citizens and volunteers are working hard to protect turtle nesting areas.)
6. Why are Emperor penguins so vulnerable to global warming? (Answer: They aren't capable of walking on the rough terrain of mainland Antarctica, so these birds are completely reliant upon sea ice to reproduce and raise their young.)
7. What other species might be affected by global warming? (Answer: Corals may not tolerate warmer water temperatures. Whales may find it difficult to find food: Their food animals may move to different areas because of changes in water temperature, and the whales may not be able to find them because their brains are "wired" to follow traditional migratory routes.)

Segment Four: Chinook Salmon in the Klamath River

In Northern California, adult Chinook salmon migrate from the Pacific Ocean up the Klamath River to spawn in the place of their birth. Segment Four of the film shows their desperate plight as the salmon find they cannot complete the journey. The cause? Dams built to divert water for agricultural irrigation are leaving too little water in the river for the salmon. They are dying by the thousands before spawning. The indigenous Yurok Indians are left without the fish that have sustained them for generations, as are commercial fishermen fishing for salmon hundreds of miles away in the Pacific.

(Visual and audio cues: Start when you see a forested coastline and Matt Damon says, "Though the full impact of climate change may be only decades away, there are other threats to wildlife habitats that have already surfaced...." Stop when you see Steve Palumbi in front of a rocky coast saying "And now the people that fished the salmon hundreds of miles away need those fish.")

Segment Four: Post-viewing Discussion

1. What factors caused the Klamath River watershed to be degraded for salmon? (Answer: Cutting of forests along the river muddied the water. Wetlands often provide sanctuary for young fish, and connected wetlands were destroyed. Also, a series of dams were built to produce electricity and to provide water to farmers for irrigation. The dams siphoned off water from the river and blocked the salmon from their migratory route.)
2. What groups of people were in conflict over the use of the water in the Klamath River? Who decided how the water would be used? (Answer: Farmers wanted the water to irrigate crops. Native American fishermen wanted the water to remain in the river so they could continue to fish in the traditional way of their tribe. The federal government came down on the side of the farmers.)
3. What caused one of the largest salmon die-offs in American history in September 2002? (Answer: A two-year drought hit the area in 2001, so there was simply not enough water for everybody's needs. When the federal government decided farmers would get Klamath River water, insufficient water remained to accommodate the annual salmon spawning migration. Approximately 33,000 salmon suffocated along the river's shores.)
4. Why are fishermen 700 miles away on the Pacific Ocean affected by the events on the Klamath River? (Answer: Salmon spend much of their lives in the ocean, and only return to the fresh-water river to spawn. Plummeting salmon numbers prevent commercial salmon fishermen fishing in the Pacific from being able to make a living.)

Segment Five: Hunting Wild Dolphins in Japan

The Japanese have had a cultural and historical tie to whale and dolphin hunting. This segment of the film stirs our ethical core by showing scenes of wild dolphins being chased, trapped, and slaughtered. Hardy Jones, a photojournalist, captures these hunts on film. As a result of his, and other such efforts, these hunts are now limited to a single village.

(Visual and audio cues: Start when you see the scene of a forested coastline and Matt Damon says, "However, there are glimmers of hope. After years of public protest, federal agencies are finally pressing for the removal of the dams..." Stop with the scene of a whale shark filmed from below and the speaker says, "but we're the first species ever to have the control of the fates of other species in our hands.")

Segment Five: Post-viewing Discussion

1. What do the Japanese do with the dolphins they trap? (Answer: They sell some of them to aquariums. They kill the rest for dolphin meat.)
2. Why does Hardy Jones film the slaughter of dolphins in Japan? (Answer: He purposely films the dolphin killing in order to make the footage available to citizens of the world. He wants to motivate people to put a stop to these mass killings.)
3. Has Hardy Jones been successful? (Answer: Dolphin hunting now occurs in only one village. It is, however, still legal to kill dolphins and whales in Japan.)

Segment Six: Returning the Sea Otter to Monterey Bay, California

The sea otter, a marine mammal adored by humans for being cute and playful, was on the brink of extinction due to hunting for its luxuriant fur. At one point, the population in Monterey Bay was down to 50 individuals. The decline of sea otters had a big impact on the kelp forest ecosystem. Without otters to eat shellfish such as abalone and sea urchins, these grazers of the sea devoured the kelp, upon which hundreds of other animals depended for food and sanctuary. Once laws were in place to protect the sea otter, their numbers increased and the health and diversity of Monterey Bay returned. Now, for unknown reasons, sea otter numbers in Monterey Bay are no longer rising. Scientists are working hard to find out what might be harming sea otters; they understand that sea otters are essential to the kelp forest ecosystem and are good indicators of ecosystem health.

(Visual and audio cues: Start when you see the scene of tall cliffs by the ocean and Matt Damon says, "I think we can all agree that the needless slaughter of animals is both shocking and disturbing...." Watch until the end of the film.)

Segment Six: Post-viewing Discussion

1. Why are sea otters so important to the kelp forest ecosystem? (Answer: Otters prey upon sea urchins and abalone. Unchecked, these creatures would devour kelp forests, which provide sanctuary to hundreds of other marine species.)
2. Why were sea otters so close to extinction? (Answer: They were hunted for their fur.)
3. Why are scientists monitoring the sea otters at Monterey? (Answer: Although their population bounced back, population growth has now leveled off for unknown reasons. Scientists want to monitor the sea otters to find out if something is making them sick. This is especially important because the sea otters are such vital animals in the kelp forest ecosystem.)

Special Projects

1. Global climate change has lately been receiving a good deal of attention. It seems as though hardly a week goes by without some new revelation being reported on T.V., in the newspapers, and on the radio. Though increasing numbers of people are becoming convinced that global climate change poses a real threat to life on our planet, including humans, some people and organizations are on record as not being convinced that global climate change requires our immediate attention.

Have your students research the controversy on the internet. Each student can record three examples of evidence either supporting or refuting the premise that global climate change is a serious problem that people need to address. Each student can also record the types of organizations (e.g., environmental groups; state, federal, and international governmental agencies; oil and coal companies, political parties, religious denominations) that are lining up on each side.

After conducting their research, have the students convene and compare their findings. Does the accumulated evidence seem to point in one direction or not? What do organizations on each side of the debate say to support their positions? What might be motivating the organizations to take the positions they do; which side seems to be more objective; which side seems more convincing? Finally, should we take action to confront global climate change or not? If your class is divided on the issue, a spirited debate might ensue!

2. Have your students visit markets or restaurants that sell seafood. Ask them to query the proprietors about seafood trends that they see. Questions to ask:
 - Where does the seafood being sold come from?
 - What kinds of seafood are becoming scarcer and, therefore, more expensive? What kinds of seafood remain abundant?
 - Do dwindling species share anything in common, e.g. habitat, such as salt or fresh water; geographic location where they came from, biological classification (mollusk, crustacean, fish, etc.), and fish size?

Once your students have completed their research, they can compare results. What species seem to be dwindling? Which species are not? Why might this be?

3. In the United States, people eat fish, but not dolphins, even though people in some other countries do. A big reason for this is that dolphins are intelligent and appealing mammals, and killing them seems to us to be unacceptably cruel. Your class might want to discuss whether killing and eating dolphins, but not fish, is wrong and whether the United States should pressure other cultures in other countries to follow our lead.

Dolphins are mammals, much more closely related to bats, elephants, and humans than to the fish they so strongly resemble. Dolphins look like fish (fins and flippers, same aerodynamic shape) because they have adapted to live in the same environment (water). When animals evolve in the same direction to fit similar environmental conditions, we call this convergent evolution, and it is a fascinating phenomenon.

If you would like to explore this further, find pictures of the following pairs of animals:

- Marsupial mole/Common mole
- Tasmanian wolf (or thylacine)/Wolf
- Armadillo/Pangolin/Echidna
- Porcupine/Hedgehog/Echidna
- Dolphin/Tuna

Ask your students to record the various features each pair has in common. Once they have finished, point out that the reason these animals share similar features is because they have evolved similar ways to adapt to similar environmental conditions. Why does each pair look alike?

- Marsupial mole/Common mole: Both are adapted to burrowing underground, as they searching for worms and other animals to eat.
- Tasmanian wolf/Wolf: Both are adapted to preying on other animals. The Tasmanian wolf, or thylacine, is a marsupial; as such, it is more closely related to the marsupial mole than to the wolf it so strongly resembles!
- Armadillo/Pangolin/Echidna. These three animals are adapted to preying on ants and termites.
- Porcupine/Hedgehog/Echidna. These three animals have independently evolved spines to protect themselves from predators, since all three are slow and cannot run away.
- Dolphin/Tuna. Both are adapted to swimming swiftly in the ocean.

4. Marine animals that are currently in danger of becoming extinct include whales, sea turtles, manatees and the dugong, some seals and sea lions, crocodiles, and some fish like salmon and sturgeon that spawn in freshwater rivers but live much of their lives in the sea. Have your students choose a particular marine animal to research. They can find animals to research on these web sites:

- www.endangered.fws.gov/wildlife.html
- www.iucnredlist.org

Ask your students to find out:

- Where the animal lives
- Why it is threatened with extinction
- What is being done to help it survive

Each student can then put the information on a poster, preferably with a picture of the animal being presented. You can then put the posters up in the classroom or the hallway to create a gallery of endangered marine creatures.

5. Sea otters are important to the kelp forests where they live, because they eat huge numbers of sea urchins that, in turn, devour kelp. Without this predation, sea urchin numbers can grow so large that they can wipe out the kelp forests upon which many marine creatures depend for survival. Species like sea otters that have unusually significant impact on their habitats are often referred to as keystone species.

The New York Times published an article January 5th, 1999, entitled “Search for Missing Otters Turns Up a Few Surprises” that detailed what happened when sea otters were removed from a kelp forest in Alaska. Among other things:

- Sea urchin populations exploded and ate the kelp.
- Fish that depended on the kelp disappeared.
- Bald eagle numbers that ate the fish dwindled.
- Starfish numbers increased because sea otters eat them, as well.

With butcher paper or poster board and markers or crayons, have your students diagram this process. Further exploration of the keystone species concept might lead your students to complete diagrams featuring other examples. Some possibilities might include the saguaro cactus, the gopher tortoise, the tropical fig, and the elephant. See what other examples they uncover!

6. Marine fish and other sea creatures are no one's property, but are available to anyone who can catch them. As a natural resource that no one owns, they constitute a commons. Examples of other commonly-owned resources include open grazing land, wildlife, and the air we breathe.

Such resources are often over-exploited in ways that privately-owned resources are not. A rancher, for example, is not going to send all of his cattle to market at once, because then he will have no cattle left to replenish his herd. To be successful, he has to think long-term. A fisher-person looks at things differently. Thinking that a particular species is being over-fished, she may decide to intentionally leave some in the ocean so they can reproduce and produce enough fish for her to catch next year. If she does this, however, she has no way of knowing whether the next fisher-person that comes along and catches the fish will make the same decision. She will have given up some income, but she will not have gained anything from her decision because the fishes she left behind are not going to reproduce after all. And so, she is motivated to take what she can whenever she can in a way that the cattle rancher is not.

To fully grasp this phenomenon, often termed The Tragedy of the Commons, your students can play a game to be accessed on the internet. Have them call up the web site of the Cloud Institute, <http://www.sustainabilityed.org>. Once they do, have them click on Play the Sustainability Game at the bottom of the page. The game will walk your students through a scenario that details why commonly-owned resources such as marine fish typically get over-exploited.

Resources

Conservation International (www.conservation.org)

Visit this page on sea turtle conservation to get information on endangered sea turtles and links to other useful sites.

Earthtrust (www.earthtrust.org)

This web site features information on an anti-driftnet campaign, a campaign to save whales, and an effort to protect Hawaii's marine wildlife.

The Leatherback Trust (www.leatherback.org)

This organization is dedicated to the conservation of leatherback sea turtles as well as other sea turtles. Look at nesting highlights for the current year.

MarineBIO (www.marinebio.org)

This web site offers a great deal of information on marine conservation, sustainable fishing, and marine species.

National Coalition for Marine Conservation (www.savethefish.org)

This organization is dedicated to protecting marine habitat, preventing over-fishing, and reducing by-catch.

NOAA Fisheries Service (www.nmfs.noaa.gov)

This site has a wide variety of information on all kinds of marine fisheries issues and conservation. Go to the following site for information specifically about sea turtle conservation: <http://www.nmfs.noaa.gov/pr/species/turtles/>.

Pelagic Shark Research Foundation (www.pelagic.org)

A non-profit research and education group dedicated to the conservation of sharks, especially those off the California coast. The site has good information on sharks and their current status in California.

Public Broadcasting System—NATURE

(www.pbs.org/wnet/nature/dolphindefender/credits.html)

Visit this site to find out more about Hardy Jones, dolphins, and an excellent resource list.

Shark Research Institute (www.sharks.org)

This non-profit organization does research on sharks and promotes the conservation of sharks. It also sponsors the Peter Benchley Shark Conservation Award.

Whale and Dolphin Conservation Society (www.wdcs.org)

The education page at this site includes a few simulations and games related to by-catch, and they also offer an adopt-a-dolphin project.

Episode #11 -- "STATE OF THE PLANET'S OCEANS"

Overview

Seventy percent of our planet is covered by oceans. They provide food and livelihood to billions of people and homes to a glorious array of marine life; they also regulate Earth's climate. In short, they are vital to the health of the planet and its living things. Yet, vast though they may be, the planet's oceans, and the life they sustain, are confronting unprecedented threats because of human activity. The State of the Planet's Oceans takes us on a journey, exploring the impact over-fishing, habitat destruction, and global climate change are having on our oceans. The threats are serious, to say the least, but the film also shows how people are successfully protecting marine resources. These actions give us hope that, with sufficient commitment, we have the ingenuity and resources needed to protect the oceans and its life.

Viewing Activities

Segment One Topic: Over-fishing

Segment one focuses on the collapse of the cod fishery of the North Atlantic Ocean and its effect on the communities of Aveiro, Portugal, and New Bedford, Massachusetts. The economies and even cultural identities of these communities have been intertwined with the cod for generations, so the impact has been severe.

Finding Segment One (Length: 13 minutes and 30 seconds)

(Visual and audio cues: Start when you see ships moored in a harbor and hear Matt Damon say, "We begin our story in a small town..." Stop when you see New Bedford in the background and Andrew Light says, "We certainly don't want to lose the forms of knowledge that we have gained over hundreds and thousands of years of having some kind of relationship with the oceans and with the seas.")

Segment One: Post-viewing Discussion

1. If people have been fishing for North Atlantic cod for at least 400 years, why has the fishery collapsed so recently? (Answer: As long as people did not catch too many fish, enough cod would survive to reproduce and replenish the population. Unfortunately, the numbers of people fishing for cod, using ever-more efficient equipment, increased to the point where the fish populations became too depleted to recover. The harvest could not be sustained.)
2. Why didn't people just agree to catch less fish to preserve the resource upon which their livelihood depended? (Answer: There are several reasons for this. First, the over-harvest of the cod was difficult to detect. Since it was going on under water, people didn't see it happening the way they would have if the animals disappearing were living on dry land in plain view. Secondly, the fisher persons confronted real economic pressures that encouraged them to catch as many fish as they could to make as much money as they could. Cutting back on the numbers of fish caught would have reduced their income. But, what was also highly significant was that no one owned the cod; the fish were available for anyone to catch. This meant that there was no incentive for individuals to reduce their catch. If someone had, what would have prevented someone else from catching the fish that the first person had left alone? The first person would have lost money, but the cod population would not have benefited. And so, without everyone working together to catch less fish, it was in everyone's best interests to catch as many fish as he or she could.)
3. If towns like Aveiro and New Bedford lose their identity as fishing communities, and people stop fishing, does it matter? How important is it to preserve the special traditions and knowledge that these towns have accumulated? How important is it to you to preserve places that are different than everywhere else? (Opinions will vary, but students might mention that we need fishing expertise to endure if we are to continue to enjoy seafood, and that the world would be a less interesting place if we allow places with unique personalities to become like everywhere else.)

Segment Two: Marine Habitat Protection: The Dry Tortugas, Florida

The preceding segment discussed a serious issue – the depletion of the North Atlantic cod fishery – that is proving to be a difficult challenge to solve. In contrast, this segment illustrates what people can accomplish with creativity and commitment. To combat coral reef destruction and the overharvesting of the reefs' denizens, the United States established a 200 square mile marine sanctuary around the Dry Tortugas Islands in the Florida Keys. The results: coral, fish, and other marine creatures have rebounded in spectacular fashion. Key to the reserve's success are the efforts of committed law enforcement officials, and the film takes viewers along as these officials patrol the sanctuary and ensure its continued protection.

Finding Segment Two (Length: 9 minutes and 55 seconds)

(Visual and audio cues: Start when you observe an aerial view of a Florida coastline and hear Matt Damon say “About 70 miles off the coast of Key West, Florida, surrounding a chain of small islands...” Stop when you see Joe Scarpa in his boat saying “...by enforcing the laws that are there, they are learning their lessons from that, they’re learning from that, and we’re gaining voluntary compliance.”)

Segment Two: Post-viewing Discussion

1. Do you think establishing marine reserves like the Dry Tortugas is a good idea? If so, why do you think we don’t have more of them? What’s standing in our way? (Answers will vary, but might include pressure from commercial and sport fishers to keep places open for fishing, and the difficulty and cost of enforcing reserve laws and restrictions.)

Segment Three: Global Climate Change: Greenland

Threatening the future of our oceans, along with over-fishing and habitat destruction, is the looming specter of global climate change. The following three segments explore this critical environmental issue. Segment Three travels to Greenland, where scientists are investigating how fast glaciers are flowing into the sea. The findings of these scientists are of great interest, because as glaciers disappear into the ocean sea level rises. This is expected to be disastrous to people living in coastal communities worldwide.

Finding Segment Three (Length: 6 minutes and 13 seconds)

(Visual and audio cues: Start when you see a smoke stack spewing forth a cloud of dark smoke and hear Matt Damon say, “The scientific community now reports that the level of carbon dioxide...” Stop when you see glacial ice crashing into the sea and hear Matt Damon say, “If the entire ice sheet should melt, the oceans of the world would rise by a catastrophic 23 feet.”)

Segment Three: Post-viewing Discussion

1. How is global warming thought to be increasing the melting of Greenland glaciers? (Answer: Warming temperatures are creating meltwater lakes on the glacier surfaces. This water drains through cracks in the glaciers until they reach the bottom where the glaciers are in contact with rock. The water lubricates the glaciers, causing them to flow more rapidly into the ocean.)
2. How does glacial melting lead to sea level rise? (Answer: When the glaciers flow into the sea, they break up and produce icebergs. These float away and eventually melt into the ocean. In addition, any water produced by melting glaciers on land will ultimately flow into the sea. Because of global warming, glaciers are melting and flowing more rapidly than before.)

Segment Four: Global Climate Change: Bangladesh

Segment Four discusses the impact sea level rise will have on one country: the crowded and impoverished nation of Bangladesh. Roughly the size of Wisconsin, Bangladesh has a population of 151 million people, or roughly half the population of the United States. It is estimated that a sea level rise of three feet will drown half the country, forcing tens of millions of people into ever-smaller amounts of land and creating increased poverty, disease, and social tension.

Finding Segment Four (Length: 5 minutes and 35 seconds)

(Visual and audio cues: Start when you see people in Bangladesh paddling around in small boats and hear Matt Damon say, “Bangladesh is a place defined by water.” Stop when you see a man carrying a load of baskets on his bicycle and hear V. Ramaswamy in Calcutta, India say, “They will go over them, through them, or under them because poverty does not recognize boundaries.”)

Segment Four: Post –viewing Discussion

1. How are Greenland glaciers connected with the tropical country of Bangladesh? (Answer: The melting Greenland glaciers are contributing to sea level rise worldwide. A sea level rise of a few feet will inundate much of Bangladesh, even though it lies halfway around the world.)
2. How will Bangladesh flooding affect the country’s citizens? (Answer: Bangladesh is among the poorest and most crowded countries on the planet. Roughly 151 million people live there, in a country the size of Wisconsin. This is about half the population of the entire United States. Most of them depend upon subsistence farming for their living. With a projected sea level rise of three feet, over half the agricultural land will be underwater, and a huge number of people will lose their livelihood and even the land on which to live. They will have to move, most likely to the already crowded capital city of Dhaka or even to India, which has 1.1 billion people of its own. These places will not have the space, homes, schools, jobs, and health services to cope with this migration. Poverty, disease, and social unrest will be the likely result. A massive humanitarian catastrophe will likely occur.)

Segment Five: Global Climate Change: Peru

Segment Five begins high in the Peruvian Andes, an odd locale for a film about the planet's oceans. Soon, however, the connection becomes clear. Global climate change is causing Andean glaciers to melt at such a pace that some scientists believe they will be gone entirely in a matter of decades. If this happens, the water supply for people living in the Andes will be threatened, so many of them will move to the coast. The vast majority of these migrants will end up in impoverished shantytowns, without running water or sewage facilities. Their wastes will end up polluting the ocean along the coast, and their need for food and employment will force many of them to take up fishing, thus threatening existing fish populations with over-harvesting, similar to that which has befallen the North Atlantic cod.

Finding Segment Five (Length: 8 minutes and 55 seconds)

(Visual and audio cues: Start when you see a high Andean meadow, or puna, and hear Matt Damon say, "These are the highlands of South America's Andes, the highest tropical mountain chain in the world." Stop when you see a power plant in the background and Scott Doney says, "I don't really think it's our choice to destroy something that they are never going to get to see.")

Segment Five: Post-viewing Discussion

1. Why is the melting of glaciers in the Peruvian Andes expected to force people living in the mountains to move to the coast? (Answer: People living in the Andes depend on the water that the glaciers provide. They are accustomed to glaciers large enough to produce a steady stream of meltwater for drinking and irrigation, even during dry periods. The concern, however, is that global climate change will shrink the glaciers to the point that they no longer contain enough water to sustain mountain communities. They may even disappear altogether. When that happens, people will not be able to farm and will have to move.)
2. If large numbers of Andean people move to the coast, what will be the living conditions awaiting most of them? (Answer: Most of the migrants will end up in shantytowns without running water, sewage facilities, electricity, or employment.)
3. How would they be expected to affect the ocean? (Answer: The increased number of people needing to eat would likely lead to increased fishing pressure on coastal fish populations. As we have seen, people often tend to catch too many fish, leading to the crash of fish populations around the world. This might very well happen in Peru. In addition, without basic sewage facilities, the communities where these people settle will be dumping increased amounts of human waste into the ocean.)

Segment Six: Marine Conservation in Belize

Segment Six focuses on another successful conservation story. The small Central American country of Belize has, like the United States, established a marine sanctuary: the Gladden Spit Marine Reserve. This reserve is protecting a host of marine creatures and their habitat. The success of this effort has created a new eco-tourism industry. People from around the world are traveling to Belize to observe and even swim with the creatures of Gladden Spit, notably the world's largest fish, the whale shark. In so doing, they are providing Belize with a new source of income and new opportunities for employment. The Gladden Spit reserve, like the Dry Tortugas Marine Reserve discussed earlier, illustrates that people do not have to stand by helplessly and witness the relentless deterioration of the oceans and their resources. We can choose a different course and, like a great array of marine creatures, reap considerable benefits as a result of our good work.

Finding Segment Six (Length: 4 minutes and 13 seconds)

(Visual and audio cues: Start when you see a fisherman in a small boat throwing a net and hear Matt Damon say, "Forty miles off the coast of Belize, on a small Caribbean island..." Stop when you see a swimming whale shark and hear Matt Damon say, "It's joined Florida's Dry Tortugas reserve as a model for marine communities around the world.")

Segment Six: Post-viewing Discussion

1. How do you think eco-tourism benefits the people of Belize? (Answer: Tourists spend money for food, lodging, guide services, and souvenirs, thus providing an income to the country and employment to its citizens. It also enables people from different countries to become acquainted with each other, thus contributing to mutual global understanding and fellowship.)
2. On the other hand, can you think of ways in which international eco-tourism might hurt a country like Belize? (Answers will vary but may include the concern that the tourists themselves may damage the environment that they have come to see by doing such things as putting pressure on fish and other marine resources, increasing human wastes, littering, and creating crowded conditions in natural areas. Students might also mention the possibility of upsetting local people by behaving rudely and being insensitive to local customs and traditions. Eco-tourism must be carefully managed to protect both the environment and local cultures.)

Segment Seven: Summary with Sylvia Earle and Matt Damon

In the final segment of The State of the Planet's Oceans, the noted marine biologist, Sylvia Earle, and Matt Damon wrap up the film with a final testimony to the beauty of the world's oceans and the necessity to preserve them.

Finding Segment Seven (Length: 2 minutes and 45 seconds)

(Visual and audio cues: Start when you see Sylvia Earle saying, "If I could, I would love to take anybody and everyone down into the sea, to see what I have come to know and love." End when Matt Damon says, "What we need now are the efforts of people everywhere, all those who are willing to find ways to strike the right balance, between what we want and what the oceans can provide.")

Special Projects

- 1. Research the Changing Availability of Seafood in Your Area** How are fish populations doing from the perspective of people in your community? Have your students visit restaurants and food markets in your community and interview the proprietors about what they have observed regarding seafood. What species seem to be scarcer, harder to obtain, and more expensive than formerly? What species seem to be as, or more, abundant than before? Perhaps your students can also find out how to contact the suppliers of the restaurants and food markets and ask them the same questions. Once your students have gathered their information, ask them to share their findings. Can your class draw any conclusions? Are there any particular geographic locations or types of habitat that seem to be experiencing population decreases of commercial fish and other marine creatures? What categories of fish, shellfish, crustaceans (crabs, shrimp, lobsters), and other types of seafood seem to be disappearing? Considering present trends, do your students think that any species are especially at risk of disappearing, like the North Atlantic cod?
- 2. Identify Best and Worst Seafood to Eat in Your Area** Print or use a projector to display a Seafood Selector or Pocket Guide to seafood-friendly consumption (see resource section). Find out which seafood in your area is best and worst to consume from an environmental standpoint. Share the findings with the school using posters, assemblies, or communications with parents.
- 3. Discover Environmental Laws Protecting Wildlife in Your Area and Local Wildlife Issues** Who is responsible for enforcing the environmental laws protecting wildlife in your community? Ask a wildlife officer or game warden to speak to your class. What are the wildlife issues with which he or she is concerned? Are there any species that are considered to be nuisances? Are there any species considered to be at risk? Is there anything students can do to help protect the wildlife in their community?

4. **Identify Coastal Cities that Will Be Impacted by Sea Level Rise** Divide the class by continent. Locate coastal cities using an atlas or map. Find their populations and altitude above sea level. Now ask groups to determine what would happen to these cities with a six foot rise in sea level, an outcome that many climate scientists believe possible considering current climatic trends. How many people would be displaced, and what will the environmental and social consequences be? Ask the teams to share their results in class.
5. **Check Out Your Local Drinking Water Supply** Clean water is essential to our survival, but it's often amazing how little people know about where their drinking water comes from. Conduct a useful research project to find out more about drinking water in your community. Visit your water treatment plant or ask a member of your community's water department to visit your school. Try to find out:
- The source of your community's drinking water
 - Whether the water supply is sufficient, or whether water shortages are a potential problem
 - How many communities are upstream and whether they might be discharging contaminants into the water source.
 - How the water department determines the contaminants that are in the water. What does the department test for (e.g. bacteria, nitrates and phosphates, sediment, toxic metals, pharmaceuticals), and what technology does it use to assess water quality?
 - How the water department treats the community's drinking water and whether the treatment methods match the known contaminants found in the water. How the department ensures that its treatment efforts are adequate.
 - Whether any water safety issues have arisen and what was done to address them.

Once your class has learned about their drinking water, they can educate the rest of the school community through such means as assemblies, posters, and the school web site. They can also determine for themselves if their drinking water is safe to drink, if it's a good idea to filter it at home before drinking, or even if they should resort to bottled water.

6. **Design an Ecotourism Travel Poster** As your class has seen, people from around the world are traveling to Belize to swim with whale sharks. Have each of your students choose a type of natural wonder (e.g. mountain range, rain-forest, coral reef, glacier, wildlife spectacle) that he or she would like to see. Each student would then identify and research a particular place with that chosen feature and prepare a travel poster that illustrates where this location is and what it offers the eco-tourist. You can then put the posters up in the hallway and even poll the students to see which place is their favorite.

7. **Describe A Special Place Worth Protecting** Sylvia Earle speaks passionately about her love for oceans and ocean life. Ask your students to think about a natural place that is very special to them. It could be a place in their neighborhood or community or a place to which they have visited or traveled. Invite them to write an essay about this special place, describing what makes it worth protecting. If desired, post the essays or have the students read them aloud.

Resources

OVER-FISHING/RESPONSIBLE CONSUMPTION OF SEAFOOD

Environmental Defense Fund

<http://www.edf.org/home.cfm>

Through the oceans section of the home page, you will find a Seafood Selector that rates the best and worst choices in terms of eating fish and seafood, as well as a wide variety of information about fishing responsibly.

Monterey Bay Aquarium

www.mbayaq.org/

The Saving Oceans section of this home page provides a pocket guide to buying ocean-friendly seafood in different regions of the U.S. You will also find information on a wide variety of marine issues such as by-catch, habitat damage, and over-fishing.

Overfishing: Guide to Good Fish

www.overfishing.org

Visit the Guide to Good Fish section to find information about ocean friendly fish to eat in various countries around the world.

History of the Northern Cod Industry

www.stemnet.nf.ca/cod/home1.htm

This site details the history of the northern cod fishery since the 1800s. The Table of Contents allows you to quickly and easily find the sections of most interest to you.

CLIMATE CHANGE

Environmental News: “Melting Andean Glaciers Could Leave 30 Million High and Dry”

www.ens-newswire.com

Find this excellent article, published April 28, 2008, at the Environmental News web site.

The New York Times: “In Greenland: Ice and Instability”

www.newyorktimes.com

To learn more about the melting of Greenland’s ice sheet, conduct a search for the January 8, 2009 article entitled “In Greenland: Ice and Instability.”

Reuter's: "Bangladesh Faces Climate Change Refugee Nightmare"

www.reuters.com

Learn more about the refugee problems Bangladesh will face with rising sea levels in this April 14, 2008 article. Visit the web site and conduct a search for the article titled here.

Science News: "For Kids: Science Loses Out When Ice Caps Melt"

www.sciencenews.org

This kid-friendly article discusses the melting of ice caps, mentioning the Andes ice caps in particular. Visit this web site and conduct a search for the article titled above, which was published on January 30, 2009.

DRY TORTUGAS AND GLADDEN SPIT MARINE RESERVES

Environmental Defense Fund

www.edf.org/article.cfm?contentid=443

The above site has information about the Dry Tortugas Ecological Reserve and a gallery of photographs of marine life found there

Friends of Nature Belize

www.friendsofnaturebelize.org/gladden_spit.html

This site provides information about the Gladden Spit Marine Reserve, including research and policing of the reserve.

The Nature Conservancy

www.nature.org

Visit the Where We Work section of this site to locate special Nature Conservancy projects in Belize. Tour the special section about whale sharks. Do a search for the Gladden Spit Marine Reserve in Belize to get more information about it.

THE WONDERS OF THE OCEAN

Google Earth Ocean

www.earth.google.com/ocean/

Take a tour of this program that looks deep below the surface of the ocean and find downloads that will allow you to explore the Earth's oceans.

Sylvia Earle

www.literati.net/Earle

Books by Sylvia Earle are described and a list of media interviews that can be accessed by the internet are provided.